BREAK-IN

September/October 2013

The Official Journal of the
New Zealand Association of Radio Transmitters (Inc.)

Dedicated to

Amateur Radio and Electronics

in New Zealand since 1928

In this issue:

- EMC Interference to Ham Radio Comms
- Overview of Small Transmitting Loops
- 630 m Equipment
- What the heck is Dongle; a review
- Multi-band vertical; "The 43-footer"
- An introduction to HF Software Defined Radio
- Thermionic emission from filaments and cathodes
- Radio Scouting; Jamboree on the Air
- NZART Conference 2014
- ZL Crossword 24

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*The term **break-in** refers to a system in CW whereby the transmitting station can hear the other station's signal during "key up" periods.*

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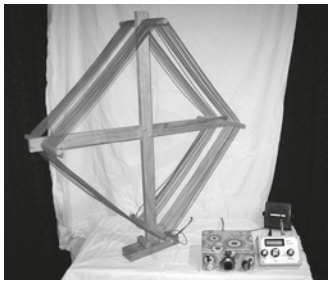

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John Walker ZL3IB
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No doubt many readers will have seen the latest NZART InfoLine and read that I plan to retire from the position of Editor after publication of the March/April issue of *Break-In*. This should give a reasonable time-frame for the appointment and transfer of roles to the new incumbent.

I have been editor since my retirement from the University of Canterbury 1996/7 and have enjoyed the challenge of producing a magazine that would be a credit to NZART and also be an interesting and readable publication. However being editor does create some problems and headaches from time to time. To this end I have been very fortunate in having been supported by a great team of associate editors, plus cooperative typesetters and printers; without this level of support the task of editor would be well-nigh impossible. I have also been most fortunate in enjoying the loyal support of my XYL Sheila; without this the job would have been totally impossible.

Ideally the new Editor will be located in the Canterbury area which will minimise possible problems regarding typesetting and printing arrangements etc and in which case I should like to think that I could continue to play a minor role in its production.

Eastfest 2013

During the week-end of 7-8 September I attended the Eastfest 2013 held in Ashburton. This was well-supported and a great opportunity to hear some excellent talks and meet hams from much of the ZL3 and a few from ZL2 regions. Congratulations to the organisers. The thought strikes me that there should be more of these local regional get-togethers; we can only benefit from such exchanges of ideas.

73, John Walker ZL3IB, Editor

Next deadline for copy is
10 November 2013

New Zealand Association of Radio Transmitters INC

(Founder Member of the International Amateur Radio Union Region 3)

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From The President

Vaughan Henderson ZL1TGC
<zl1tgc@nzart.org.nz>

By now you may have noticed that our two-weekly Headquarters Infoline bulletin has a new editor. I'd like to thank Mike Bull ZL2VM for taking on the Editor's Job. Debby ZL2DL had picked up this additional task when the previous editor, Jamie Pye ZL2NN became a silent key. You will notice a change of presentation style in Infoline since Mike has taken over. Thanks very much Mike for taking on this job which helps us keep you, our members better informed. Back issues of HQ Infoline are available on our web site, but if you would like your own copy, emailed direct to you, go to <http://www.nzart.org.nz/join/e-mail-lists/join-infoline-list/> to get a copy sent direct to your email inbox.

Two new Councillors appointed to fill the vacant positions in the Central Electoral District. At its September meeting, your Executive Council appointed Malcolm Wheeler ZL2UDF from Lower Hutt, and Max Wheatley ZL2MAX from Ashhurst, to fill the two vacancies. My congratulations to Malcolm and Max on their appointment and for offering their services to your Association. I would also like to thank the other two members who put their names forward following a call for expressions of interest following the AGM and Conference in June and I hope they will consider making themselves available when we again call for nominations for Council in December 2014.

The Ministry of Business, Innovation and Employment's Radio Spectrum Management (RSM) group have published a new edition of *Public Information Bulletin (PIB) 46*. Back in May this year, PIB46 Edition 14 saw the status of single letter call-signs revert back to the requirement for a six month stand-down before they can be re-allocated. Thanks to representations made by our ALO, Don Wallace ZL2TLL and some great lobbying by amateurs who are active contesters, the Radio Spectrum Management Licensing Manager agreed to revert back to the situation which applied prior to the issue of PIB46 Edition 14. This is very good news and means that those contest groups and others holding a single letter call can be assured of its continuity as long as it is active. i.e. in regular use. It will still be necessary to re-apply once every 12 months as the single letter call-signs are classified as temporary calls under the PIB46 rules. When applying or re-applying for a single letter call-sign, if your previous amateur certificate of competency does not include a photo, you will need to send in a passport size photo with the application. RSM have made it a mandatory requirement that all new and updated certificates have a photo ID included on them. PIB 46 edition 16 is available from the Radio Spectrum Management web site.

On a sadder note, I note over the past three months, the passing of twelve more members of our Association. I would like to mention two of them: Colin Robertson ZL4KJ, became a silent key as the result of a car accident at East Taieri while travelling to an Otago Branch meeting on 7 August. First licensed in 1948, Colin had been a member of our Association since 1949 and served on Council from 1995 to 1999, ably representing the amateurs in the ZL4 area.

Another recent silent key is Harry Burton ZL2APC. Harry passed away on 6 August 2013. First licensed in 1951, Harry was a very active amateur, held a variety of positions with Hutt Valley Branch 18 and was elected to NZART Council in 1964. Harry was President of your Association from 1966 to 1969. He also contributed many articles to *Break-In* magazine including a "Technical Topics" column which he started in 1967. After an early career with Civil Aviation, he joined the Patent Office, and progressed to the top position of Commissioner of Patents and was noted for his presentations on the workings of the Patent Office at branch meetings.

Council has now held the last three of its monthly meetings using Skype and I can confirm that this will be the preferred medium for these meetings from now on. The minutes of these Council meetings will continue to be made available on the NZART web site. I am aware that in the past, members liked to listen to the Council net and using Skype prevents this. However the success of the Council meetings using this medium and the ability to have a good discussion on Council business with all Councillors present being able to clearly hear and take part means we will be continuing to make use of Skype. It also looks likely that we will be able to dispense with the in-person meeting held each February at Wellington Airport which will result in a significant cost saving to your Association. Through this column in *Break-In* and *Headquarters InfoLine* I will do my best to keep you all informed of our on-going work and activities.

Work is continuing to try and keep this year's expenditure within budget. At the start of our financial year, we were faced with a deficit of $7520 for our 2013 financial year without any extraordinary items of expenditure. Council formed a finance sub-committee to look into all areas of expenditure and this close scrutiny has resulted in savings in several areas. An immediate saving was the decision not to send anyone to the Asia-Pacific Telecommunity (APT) preparatory meeting (APT15-2) held in Bangkok, Thailand in July this year. Further small savings have been made in the area of Council expenses. A new Council policy on travel and accommodation refunds when attending our annual conference now requires Councillors to meet more of the expenses incurred. This resulted in an immediate saving on Council costs for our annual conference in Masterton. A review of the cost of *Break-In* printing and postage did not generate any savings apart from a reduction in the hourly rate for typesetting. The cost of Headquarters operations continues to be monitored and we are trying with the assistance of Sharp NZ Ltd., to replace the photocopier at HQ with a lower cost machine. As a result of these initiatives, I am fairly confident that we will show a small financial surplus at the end of the 2013 financial year.

I'm pleased to be able to announce that an agreement has been reached between New Zealand Administration (MBIE) and Japanese Administration (Ministry of Internal Affairs and Communications) who have signed an agreement formalising reciprocal licensing between the two countries. Under the agreement, the NZ General Amateur Operators Certificate will be recognised as equivalent to the Japanese First Class Radio Operator's qualification and a NZ Amateur will be permitted to establish and operate a station as an amateur radio operator in Japan.

Similarly, the Japanese First Class and Second Class (but not 3rd and 4th Class) Radio Operator's qualification will be recognised as equivalent to the NZ General Amateur Operators Certificate; and the holder of a Japanese First or Second Class Radio Operator's qualification visiting New Zealand may operate for up to 90 days using their Japanese assigned call-sign, with the addition of the ZL prefix.

Elsewhere in this issue of *Break-In* is a statement from Radio Spectrum Management regarding the requirements for listing sales of amateur radio equipment on TradeMe®. Please have a look at this if you are an active trader on at this on-line auction site.

My thanks to those amateurs who have come forward and offered to help with an update and revision of our web site. I'm working on a specification to define what we want, including a members only section, and will report back to you once that's in place.

Jamboree on the Air (JOTA) is coming up again over the weekend of October 19-20. 2013 is the 56th JOTA and the theme for this year is "Lets Share". JOTA is an excellent opportunity to introduce amateur radio to younger people and I hope you have taken advantage of this. Marie Smolnicki, ZL2THE, is the National Organiser for Scouting New Zealand and you can contact her at <mah_re@xtra.co.nz>. The world scouting organisation web site at <http://www.scout.org/en/information_events/events/jota/the_56th_jota_2013> has some further information and ideas to help you make the JOTA weekend an interesting experience for young people in the Scout and Guide movements.

Vaughan Henderson,
President, NZART (Inc.)

EMC and Interference to Ham Radio Communications

by Brian Emmett ZL3BE <brian.emmett@xtra.co.nz>

A recurring theme I find in discussions with Hams is the frustration they feel at the ever increasing level of interference on the ham bands. Equally infuriating, if not more so, is the apparent inability or unwillingness of the regulatory authorities to do anything resolve it.

Clearly these two issues are of considerable importance and whether or not there is any validity to them will be explored in this article. Ham Transmissions causing interference is a separate issue.

The first question then relates to the level of interference to radio communications; is it increasing? The answer to that is an unequivocal 'yes'; it is. All electrical and electronic products are capable of causing interference to radiocommunications to varying degrees and while this can generally be reduced to a reasonable level by good design it doesn't always happen. In recent times the range of potentially interfering products available has grown explosively while at the same time the technology used is becoming increasingly sophisticated, often based on digital technologies which are inherent producers of electromagnetic emissions.

Another factor to consider is that regulation always lags technology. For instance one of the unresolved issues facing interference regulation today is the impact of large numbers of products operating in a confined area. A LED lamp or CFL on its own will comply with applicable emission limits but the combined emissions of tens or hundreds in a localized area can readily exceed them. Likewise a television set or computer on its own will comply but when a number are operating in the same locality there can be trouble. In this situation the regulatory authority currently has no answer nor does it have the ability to manage it.

Before looking into the second question; the apparent inability or unwillingness of the regulatory authorities to do anything to resolve this problem, it is necessary to know something about EMC and the regulatory compliance framework in New Zealand. Unfortunately it is not good news for those of us in the ham fraternity but that is the reality of life in a commercial environment.

- Electromagnetic Compatibility (EMC) is an umbrella term for two related concepts, electromagnetic interference (EMI) and electromagnetic susceptibility (EMS).
- EMI is the expression used to describe unwanted electromagnetic emissions that may be conducted through wiring or radiated through space.
- EMS refers to the ability of a product to function correctly in a potentially hostile electromagnetic environment.

New Zealand, as most countries do, has regulations to govern the supply of electrical and electronic equipment capable of causing harmful interference to radiocommunications. In New Zealand the Radio Spectrum Management group (RSM) of the Ministry of Business, Innovation, and Employment (MBIE) is the regulatory authority; until recently this was the Ministry of Economic Development and prior to that the Ministry of Commerce.

There are two principle methods of controlling EMC, the Command and Control system used in the United States and some other countries and the Self-Declaration system used in New Zealand, Australia and most of Europe. Regardless of which is adopted it must carefully balance the need to minimise compliance costs with the need ensure adequate protection for radiocommunications.

In New Zealand it is the Radiocommunications Act 1989, that regulates radiocommunications. However this is a high level document so section 133 of the Act provides for the making of regulations which can be more specific, in this case the Radiocommunications Regulations 2001. Even these regulations can lack detail and consequently Regulation 32 provides for the publishing of Notices and it is these Notices that prescribe the EMC compliance framework in detail. They can be found on the RSM web site at <http://www.rsm.govt.nz/cms/policy-and-planning/spectrum-policy-overview/legislation/gazette-notices/product-compliance>

The notices list EMC standards, radiocommunications standards, compliance processes and Mutual Recognition Arrangements (MRAs) in place with other countries. Note that these Standards, which all products supplied in New Zealand, without exception, must comply with, are written by international committees made up of representatives from industry, regulatory authorities, testing laboratories, and on occasions, user groups. New Zealand is represented on all the major standards bodies and thus can influence ensuing standards.

For compliance purposes products are divided into three Levels of Conformity; level one contains those least at risk of causing interference to radiocommunications, level two those considered a medium risk and level three those considered a high risk. The only difference between the levels of conformity is in how compliance is demonstrated and administered. RSM uses a mix of encouragement, auditing, and enforcement, including issuing Warning and Infringements Notices, and even prosecution of errant suppliers.

Now the crunch point. It is this legal requirement for electrical and electronic equipment supplied in New Zealand to conform with one or more standards that is at the heart of our problem; but it is also important to understand clearly that the regulators are constrained by it as well, and within that constraint there is no doubt that they do everything they can to minimise interference to radiocommunications in this country.

These regulations and standards were developed to protect licensed broadcasting services, commercial radiocommunications services, and public safety services. They are designed to minimise interference, not to eliminate it; and they are not designed to protect ham radio communications.

The reason for this is that equipment used in licensed services must meet very strict and very specific performance standards and in addition an operator's licence only applies to the coverage area where reliable communications can be expected. While operating within those constraints a licensed fee paying service can reasonable expect RSM to protect it from harmful interference.

The ham radio service on the other hand is a pioneering service where equipment performance and coverage areas are highly unpredictable and where equipment is generally operating far outside the limits normally imposed on commercial operators. Unlike licensed operations Hams don't pay licence fees and so it is not reasonable, or even practical, to expect interference protection under all those conditions.

There are, however, three scenarios where a ham operator can request action from RSM although in most instances it helps a great deal if the Ham can identify the source of the interference.

- If the source turns out to be a non-compliant product RSM could be expected to investigate. This is actually becoming more common as on-line shopping becomes increasingly popular.
- If the source of the interference is a compliant product with a fault condition then again RSM can be expected to investigate.
- If the amateur operator can demonstrate the source is also causing interference to a licensed service such as a broadcasting station then RSM is obliged to investigate.

Compliance with the EMC regulations includes a requirement to affix a compliance mark, generally on the product label. In most cases that mark will be the C-Tick although the less common Regulatory Compliance Mark (RCM) may also be used. In March this year the C-Tick mark began a phase out period and the RCM mark formally became its

Radio Scouting; Jamboree on the Air

I would like to introduce myself. My name is Marie Smolnicki and I am the new National coordinator for Jamboree On The Air (JOTA) and Jamboree On The Internet (JOTI) for Scouting NZ. I have taken over from Jim Parnell who retired after the last JOTA weekend in 2012. I have been an amateur radio user since about 2002 using ZL2THE, but have been involved with JOTA since 1985. JOTA/JOTI is the international event for Scouting that is held every year on the 3rd whole weekend in October. The JOTA/JOTI weekend is for all Scouts and Guides to talk to other Scouts and Guides around the world using amateur radio and the internet. I am also a Cub leader in Maungaraki Richmond Scout Group in Lower Hutt and involved with Brookfield Scout camp in Wainuiomata, Lower Hutt.

"What is Jamboree-on-the-Air (JOTA)?

The JOTA is an annual event in which Scouts and Guides all over the world speak to each other by means of amateur radio contacts. Scouting experiences are exchanged and ideas are shared, via the radio waves.

When Scouts want to meet young people from another country they usually think of attending a World Jamboree or another international gathering. But few people realize that each year about half-a-million Scouts and Guides "get together" over the airwaves for the annual Jamboree-on-the-Air (JOTA). Modern communication technology offers Scouts the exciting opportunity to make friends in other countries without even leaving home.

Since 1958 when the first Jamboree-on-the-Air was held, thousands of Scouts and Guides have "met" each other through this event. Not only is it fun to talk to Scouts from other parts of the world but it provides also a chance to find out about other countries and about Scouting elsewhere. Many contacts made during the JOTA have resulted in penpals and links between scout troops that have lasted for many years.

With no restrictions on age, on the number that can participate and at little or no expense, JOTA provides an opportunity for Scouts and Guides to contact each other by amateur radio. The radio stations are operated by licensed amateur radio operators. Many Scouts and leaders hold licences and have their own stations, but the majority participates in the JOTA through stations operated by local radio clubs and individual radio amateurs. Today some operators even use television or computer linked communications.

Date and duration of the event

The world-wide Jamboree-On-The-Air is organised to coincide with the third full weekend of October each year. The event starts at 00.00 hours local time on the Saturday and concludes 48 hours later at 24.00 hours local time on the Sunday. Each station can choose its own operating hours within this period.

From the World Organisation of the Scout Movement, WOSM web site

JOTA relies on the help of amateur radio branchs to help Scouting with the radios and the linking with other radio JOTA stations both in New Zealand and overseas. Many Scout groups may come to a branch to ask for your help. Some branches have the JOTA station at their club rooms. The radios are already all set up along with aerials so there is not the same set up required. Some groups have their JOTA station set up in their own dens. This is also good as there is a dry area to work with the ability to have different rooms for talking and also other activities going on as well. Some Scout groups have camps. This can be a lot of work for the radio clubs to set up a field activity although it is a lot of fun. The Scouts have a lot of fun at camp as well especially when there have other activities to do like camp cooking and building their own shelter.

The theme for this year is "Lets Share", and this is the badge and logo.

- <http://www.scout.org/en/information_events/events/jota_joti> This is the International headquarters web site for information on JOTA.
- <http://www.jotajoti.org/community/>. This is the site that Groups can log in to register their JOTA station which will be added to the data base at world headquarters. It means that any group can look and contact specific groups if they wish instead of waiting for a CQ or calling for a CQ.

World Scout Frequencies

Several amateur radio bands have designated frequencies where Scout stations can meet. Of course, the whole authorized band can be used for Scout contacts, however, to easily find Scout stations, listen in on the following Scout frequencies:

Band	SSB (phone)	CW (morse)
80 m	3.690 & 3.940 MHz	3.570 MHz
40 m	7.090 & 7.190 MHz	7.030 MHz
20 m	14.290 MHz	14.060 MHz
17 m	18.140 MHz	18.080 MHz
15 m	21.360 MHz	21.140 MHz
12 m	24.960 MHz	24.910 MHz
10 m	28.390 MHz	28.180 MHz
6 m	50.160 MHz	50.160 MHz

These are the bands that the world Scouting organisation has allocated, but as it says, all the bands are available for the weekend; this just gives us a start. We can also use ECHOLINK , D Star, IRLP, National link and the local bands.

In the Wellington area there is a JOTA /JOTI camp at Brookfield Scout Camp where Scouts are going to camp on site and Cubs, Guides and other Scouting people can come in for the day. Each Scout group camping will have an activity so that the Scouts and day visitors have some more things to do. Branch 18 Hutt Valley, is running the radio side with help from Branch 42 Titahi Bay.

I would like to thank you in advance if any branch is able to help the Scouts in their local area. If you need further information you can contact me via email <mah_re@xtra.co.nz> I would like to know which branches are involved in JOTA as I need to write a report after and of course would like to contact as many as I can during the weekend.

Marie Smolnicki
ZL2JOTA, ZL2THE

replacement. The basic difference is that the C-Tick signifies compliance with radiocommunications and EMC regulations only while the RCM adds electrical safety regulations and, in Australia, telecommunications regulations. Therefore if a product is causing interference and it doesn't have a C-Tick or RCM mark on it then it is very likely it is non-compliant and should be brought to the attention of RSM.

NZART does have an EMC liaison officer (the author) who is familiar with the regulatory framework and with the limitations placed upon RSM in dealing with the ham fraternity. That officer is available to provide advice and liaison on radio spectrum regulatory issues facing our hobby.

Doing A Jock White Field Day

by Jim Reed ZL1LC

I've participated in a small number of Jock White Field Days (JWFD) over the last five or six years and have been successful, by my standards in a few. I started out in the main stream but switched to the QRP section as a field station and have managed to pick up two firsts and a second over the last three years.

Why the QRP section? Firstly, it's fun playing with only a little power. Secondly, because I live on Waiheke Island, I want to be prepared for the disaster if or when it comes. Running SSB QRP from batteries will allow me to keep on the air a lot longer than I would be able to do with a standard 100 W transceiver.

Here's a picture of how I play in the JWFD which I hope may stir up some enthusiasm in others so that next JWFD there will be more on the air.

Start by getting a copy of the rules and reading them a couple of times. <www.nzart.org.nz/activities/contest-rules/rules-jock-white-field-day/> then communicate the date with the family. Tell them when and what's happening and mark it on the calendar for all to see. Follow that up by writing things down in a notebook; – all your thoughts, requirements etc relative to the field day. Use it on the day too, to write down ideas for improvements.

An important thing you need for a field station is a branch number, believe me. If your local branch is not going to be activated, ask the executive, by letter, if you can use their branch number for the JWFD. If there's no branch number readily available for you to use, then hassle the organiser, Stuart ZL2TW <clareandstuart@xtra.co.nz> and he will tell you what to use.

It should be noted that there is nothing stopping a home station operating from their nice warm house, using their standard antenna and transceiver. Many do. Thanks guys. They simply use a 00 Branch number to identify that they are not in the field.

You then need to figure out where you are going to operate from. For a field station, you need to be under a temporary shelter, using a temporary antenna and take power from anything that is not hooked to the national grid. Sitting in a tent with a fishing pole antenna on the front lawn using battery power will fit the bill, however if you can site your tent and antenna next to a decent piece of water, you may get some gain off the body of water. Always have a fallback site in mind. One year I planned to set up on the beach at Woodside Bay, but when I arrived there was a gale blowing and I could not get the tent to stand up, so I had to go home and work from the front lawn.

Don't forget to think about toilets, food and feeding of the operators and the sleeping accommodation.

For me, the antenna is the most important piece of radio kit. I have tried dipoles and Buddipoles, but last year I built a Windom and I believe this to be the best for field days as I can switch between the 80 and 40 m bands simply by changing the frequency. I went to the Carolina Windom pages <www.hamuniverse.com/k4iwlnewwindom.html and www.m0ukd.com/Carolina_Windom/> and played there. The top sections were 44' and 88' long and the coax dropped 21' before it hit the isolator. All the baluns were wound on standard broadcast antenna ferrite rods. The antenna worked so well that I used it as the main ZL7LC antenna when I went to the Chathams. For me the real secret is the use of 75 ohm coax from the radio to the balun. That gives a better match at the 4:1 balun feedpoint where the coax now ends up as 300 ohms, not 200 ohms when 50 ohm coax is used. At the transceiver, even a built in matching or tuner can easily handle the transition from 50 to 75 ohms.

The centre of the antenna was supported by a 10 metre telescopic fibreglass pole and the ends were elevated by a couple of 5 metre telescopic fishing poles that seem to have lost their top sections, so are only 4 metres high. Both fishing rods were set in standard surf casting stands. The telescopic pole and fishing rods were purchased off TradeMe®.

The bare essentials for a field day. On the left the shelter, folding table and a chair. Next is the antenna, the poles and stakes etc. Then there are the power sources, radio, log book and lights. On the right is the food and water container. If camping out on the beach overnight, then I would also need my tent/cot (camp stretcher with a tent over it,) toilet and toilet tent.

The wire used was the very thin, but strong wire from the Wireman. His #534 has a 25 pound breaking strain. It's US$0.18 per foot for 100+ feet and they claim 1000' is about a pound in weight so the postage won't break the bank <www.thewireman.com> Also check out the wire winders from <http://www.sotabeams.co.uk/> They are great.

Remember that you can't erect your antenna before midday on the Saturday of the competition.

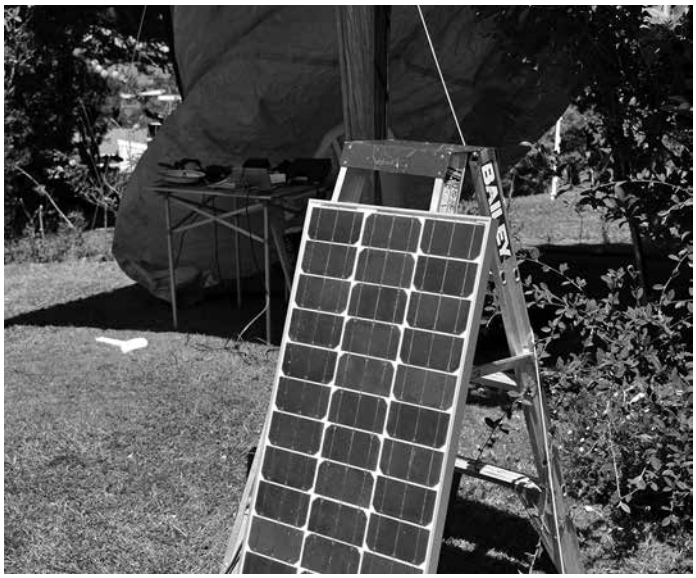
The radio I use is an Icom 703+. It's got an internal tuner so there is no problem switching bands and there are plenty of memories. I have had the W4RT SSB filter fitted to try and keep down some of the chatter that blasts through from so many stations operating in a small area of the band. That has helped a lot. It is fitted with a microphone that has the AB5N modification and that makes quite a difference to the audio. See <www.7000mic.com> I did try a brand new Heil Traveller. Initially the mic was shorted and even when I fixed it, the audio was not as good as the AB5N.

My front lawn set up was nothing more exciting than a $30 Warehouse cabana (tent without any sides), a picnic table and a plastic chair. It got cool in the evening wind, so I tied a plastic tarp to the frame of the cabana and wore a few extra clothes. I did burn a number of mosquito coils to keep the mossies at bay. Lighting was a simple head mounted LED torch on the lowest setting.

By smiling sweetly, I could get meals and a cup of tea from the chef inside the house and there was always a comfortable bed to crash into late at night.

Power to last 18 hours of operating is always a challenge. I have used LiPo (Lithium Polymer) batteries from radio control planes. They are light and work down to 9.6 V, the lowest voltage for the 703. They are not easy to charge in the field. 7AH sealed lead acid (SLA) batteries are plentiful but you need two or three and have to recharge them. A starter pack for jump starting a car is very handy. My one has a 33Ah SLA and the handle makes it easy to carry, but is a bit heavy. To keep it topped up during the day, I have the choice of a 20 W or 60 W solar panels and regulators. With the SLAs you need to monitor the battery voltage as the 703 will happily work until the battery dies and that is not good for the battery. A "Watts Meter" is a great tool, provided you look at it.

When it comes to operating, the first thing you need to do is sort out your log. The JWFD rules <www.nzart.org.nz/activities/contest-rules/rules-jock-white-field-day/> tells you the layout order in rule 16.3. I created



The 60 W solar panel pumping power back into the battery.

a table in MS Word and printed off a number of sheets which I hold in a two ring binder so Bill Gates can't mess me around on the day.

After that, the most important operating items are the chair and table. You are going to be sitting for 18 hours, so make sure you have a comfortable chair and table. The plastic chairs from the Red Shed are not bad, but you'll probably need a bit of padding. I have a portable camping table that folds up but is pretty close to the right for me.

Next I set up the memories on my 703. I added frequencies into memory starting at 3.560(suggest 3560) MHz in 2 kHz steps all the way up to 3.640 MHz. I did the same from 7.040 MHz to 7.100 MHz. These are the frequencies most commonly used on JWFD. I'm not sure why we play or crowd ourselves in such a limited portion of the bands, but that's the way the game is played, so you just have to follow the trend.

The reason I used the memories like this was to stop me getting an aching arm. You can tune across the band with the tuning knob, but it's either too slow or too fast. With the frequencies set into memory, you can slowly wind through the band. Stop up to 10 seconds per channel to listen for a station. When you hear a station, even though it may be off frequency, you can quickly tune into him. Most people operate on the kHz, which is easy to tune, but there are those difficult people who operate on the half or quarter kHz. I'm sure they would have more contacts if they stayed on the kHz, but that's the JWFD.

Working SSB with 5 W maximum, you have to "Hunt and Peck." That is, you tune the band looking for a station and when he is free, you jump on him. "Running a frequency," where you sit on a frequency and call CQ, is possible, but I have only managed it for a few minutes before some 100 W station sneaks up besides you and swamps you. Running a frequency and calling CQ with QRP is best done at the start of the hour or in the last ten minutes.

Each hour is a new contest period, so you call as many people as you can on the bands, exchange ciphers (RST, incrementing serial number and Branch,) and when the next hour comes along, you do it all again. It's really a number of Sprints.

The way I have noticed the game is played is that at the start of the hour, everybody crams into the small section of 80 m. About 20 minutes into the hour, they all move to 40 m, and the last 20 minutes is anybody's guess. They will be anywhere or maybe they are having a drink and something to eat.

During the daylight hours, you are limited to a range of a couple of hundred km but when darkness comes, it is not impossible to work VK, even on a measly 5 watts. It's a good education in propagation.

The show's not over until the paperwork is done and that is very true of the JWFD, but this doesn't have to be done on the day of competition. Somewhere on the NZART web site are three sheets that need to be filled in. These are the Summary sheet and the two Branch sheets. If you can't find them, email the contest manager, whose email address is on the bottom of the JWFD rules page.

Sunday morning. The mossie coils and insect spray show that. A clock is on the back left corner. The switch and dummy load for moving between two antennas and for testing.

The big pole for the Windom.

Start with the branch sheets, and note which call you will count as the scoring branch for the band. In your log, use a coloured highlighter to show first contact with the 80 m branch and then use a different colour to show the first contact with the branch on 40 metres. This makes it easier for the contest manager to check the logs, for example, when you start operating at 3 pm, the first contact is Branch 02 on 80 m but you don't contact them on 40 m until 3:30 pm. You would note the two contacts onto the Branches sheet in the PH column and in your log, use a highlighter (green) for the 3 pm contact on 80 m and another highlighter (yellow) for the 3:30 pm 40 m contact. There would be no other Branch 02 QSOs highlighted in your log.

The completed branch sheets give you the number of branches you have worked in CW and PH. Then it's a simple matter of multiplication and addition to come up with a magic number. Re-check the summary sheet a couple of times and then take the three sheets and your log and mail them off to the contest manager.

Sometime down the track, the results will be published and if you are really lucky, you may get a small certificate for your achievements before the next JWFD comes around.

Get out there and have a go. It really is a fun activity. βi

70 cm Band Plan

Arising from concerns expressed regarding the existing 70 cm band plan, NZART Council formed a working group to conduct a review of the existing band plan, and called for submissions on changes. The working group is made up of Councillors Phil King ZL1PK, Neil Ellis ZL1TAJ, and Warren Harris ZL2AJ along with David Andrews ZL2SX, Doug Ingham ZL2TAR and Terry Thomas ZL4TAE from FMTAG. This working group had a relatively open and simplified terms of reference.

A first draft of a band plan was completed and sent for comment to those who had submitted to the plan.

The plan set out below has resulted from this process and is submitted to allow others who may not have seen the initial call for submissions to make comment. Please send comment to either NZART HQ for attention of the 70 cm Band Plan Review Group or by email to <70cmreview@nzart.org.nz>

Inevitably not all the initial suggestions could be incorporated within the one band plan. In the paragraphs below the plan I have endeavoured to set out some of the assumptions/decisions made.

Draft 70 cm Band Plan for comment September 2013

430.00 to 431.90	Links and similar
431.90 to 432.00	Guard Band EME
432.00 to 432.10	EME
432.10 to 432.60	Narrow Band modes BW 6 kHz or less
432.10	National Calling Frequency Primary
432.20	National Calling Frequency Secondary
432.25 to 432.30	Beacons (horizontal polarisation)
432.40 to 432.60	Guard Band Australian Beacons
432.65	Packet digipeaters
432.70	VOIP Simplex
432.725	VOIP Simplex Secondary
432.75	P25/Dstar/DMR Simplex
432.775	APRS
432.80 to 432.975	FM Simplex (5 kHz or less deviation)
433.00 to 434.79	Repeater Inputs/Outputs (**note 1**)
434.80 to 435.00	National System Repeaters (**note 1**)
435.00 to 438.00	Amateur Satellite Operations
438.00 to 439.79	Repeater Inputs/Outputs (**note 1**)
439.80 to 440.00	National System Repeaters (**note 1**)

Note 1:

Repeaters in this band are normally negative 5 MHz offset but where there are problems with SRD/LIPD devices on the repeater input a suitable positive offset repeater frequency pair can be obtained from FMTAG. (reference the FMTAG paper *"The Impact on 70 cm Repeaters of the General User Radio License (GURL) for Short Range Devices (SRD)"* issue 2 which may found at <http://www.nzart.org.nz/nzart/fmtag/srd-impact-on-repeaters/)>

The existing allocation for repeaters including the National System repeaters was not changed as the cost and difficulty of re-engineering all of these repeaters was not felt to be offset by a significant benefit. The availability of positive repeater offset pairs, even though this also requires re-engineering, along with selective use of CTCSS on repeater receivers should address a lot of the problems with SRD/LIPD interference.

Some submissions proposed a change of the repeater band or a change in the offset from 5 MHz as a means of reducing the SRD interference.

Beacons would also need to be re-engineered if we wished to move them. Our beacons and the Australian ones should be offset from each other so that at times of enhanced propagation there is no mutual interference. In any event we have provided a guard band for the Australian beacon frequencies in the same way as the Australians have for ours.

The allocation of 435 to 438 MHz to the Amateur Satellite Service is an existing International allocation and by International agreement should be kept clear of terrestrial transmissions. This protects both satellite outputs which are frequently in the weak signal category at the earth's surface, and satellite transponder inputs.

Allocations were confirmed in the space between the beacon band and the repeater band for Packet digipeaters, APRS SX, VOIP SX, Digital voice SX, and FM SX. These partly reflect existing usage.

Some submissions proposed a wideband allocation for DATV. The Australian band plan has such an allocation but it is in the 440 MHz to 450 MHz area which is not available to us.

Concern about the interference potential of wideband modes was a factor in many of the submissions received. The incompatibility of wideband modes, despite their relatively low power density, with repeater inputs, weak signal work and satellite transponder inputs was considered carefully, with the result that no provision was made for DATV in the proposed band plan.

I have reproduced below an interference calculation from one of the submitters which may help clarify the situation.

Assume the following:

Frequency	434.00 MHz
DATV bandwidth	8 MHz
FM receiver bandwidth	16 kHz (0.002 (-27 dBm) of the 8 MHz bandwidth)
DATV transmitter EIRP	100 W (25 W (44 dBm) transmitter to a 6 dBi gain antenna)
Receive antenna	2.14 dBi (dipole)
Receiver sensitivity (FM)	0.22 µV (-120 dBm) for 12 dB SINAD
Distance of RX from TX	50 km

For simplicity assume no coax losses.

Also that FM capture effect is 2 dB (signal suppressed if stronger signal is 2 dB stronger.

The Path loss calculation in dB is:

Path loss = 32.44 + 20*logF + 20*logD – Gtx –Grx

Where F is in MHz, D is in km, Gtx & Grx are in dBi

Path loss = 32.44 + 20*log434 + 20*log50 - 6 - 2.14 = 111 dB

With the equipment as detailed above the Receive level from the DATV transmitter is 44 (power out) -111 (path loss) = -67 dBm (this is in an 8 MHz bandwidth)

In the 16 kHz bandwidth of the FM receiver this gives -67 dBm – 27 dB

Which yields – 94 dBm as the potential interfering signal

Allowing for capture effect any wanted signal has to exceed -92 dBm

Based on this the wanted signal must be greater than S9 to not be suppressed by the DATV signal. This is using the IARU Region 1 Technical Recommendation for S meter calibration which has S9 as -93 dBm for VHF signals.

Phil King ZL1PK, Chairman
70 cm Band Plan Review Group

630 m Equipment Investigations and Construction

by Gilbert Best ZL3GIL <gilbie68@gmail.com>

The 630 m band was made available for use by ZL hams in late 2012 (ref. 1) and the band covers the frequency range from 472 kHz through to 479 kHz. Power emission is limited to 25 W eirp with no bandwidth restrictions.

Casting a glance through recent issues of *Break-In* shows that there is a small group of enthusiasts who run test transmissions on Thursday evenings. There is also a 600m Yahoo group (ref. 2) in which the VKs arrange their transmissions. In fact, the VKs have taken a real shine to 630 m and they are just itching to establish some trans-Tasman QSOs by using a variety of data modes. Some of these modes include WSPR, Domino, Opera 8 and CW

Some commercial gear is available for this LF band but generally it falls to the operator to assemble their own equipment. Fortunately LF is a homebrewer's delight and most of the parts are available from local component suppliers. The more exotic parts are available from the likes of element14 and RS Components®.

The internet has been a valuable source of information for my foray into the world of 630 m. Here's a summary of what I've seen, combined with what I've actually assembled and what I intend to assemble over the next few months:

Receivers

1 Regenerative MW Rx by Alan Yates VK2ZAY (ref. 3). This Rx's range extended into the first 20 kHz of the 160 m band and I was able to hear a ZL putting out some CQs a couple of years ago. I plan to lower the tuning range to below the MW BC band and then use this as a monitor Rx.
2 Regenerative upconverter by Lloyd Butler VK5BR (ref. 4) that uses a loop antenna to null out local noise and an NE602 to mix incoming LF with a 4 MHz LO. The idea is that a communications receiver with a digital display is then used and the received frequency is simply read off display whilst ignoring the 4 MHz part of the display. I've built the loop antenna and the upconverter and am thinking of modifying my MKARS80 transceiver to cover the 4.472 – 4.479 MHz Rx range.
3 Selective Level Meter. I have a Wandel & Goltermann SPM-3 meter which could be useful for sniffing out a bit of LF.
4 SDR Rx kit from KB9YIG (ref. 5). For about USD$32 this could be just the business. It uses a PC running Argo, Rocky or any other SDR decoder and will allow the entire band to be viewed at a glance. The one that I've built seems a little bit deaf but I may have to recheck some toroid windings as well as sorting out the Line Input on my laptop's soundcard.

Transmitters

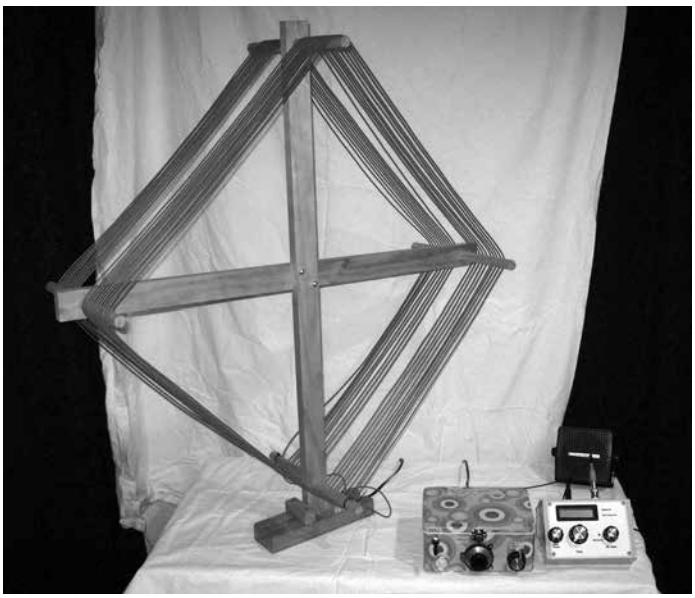
I discovered a treasure trove of useful circuits on the website of GW3UEP (ref. 6). He has described Tx setups from the VFO right through to a useful 100 W PA in addition to many other LF goodies:

1 472 kHz VFO. This is the circuit I brought along for Show & Tell during the March 2013 Br56 club meeting.
2 1 W PA which could be suitable for QRSS activity. This works fine on the test bench but I haven't yet deployed it.
3 25 W PA which was one of my Easter weekend projects. The special caps arrived from element14 within two days of being ordered. Early bench tests indicate a power efficiency figure of just under 82%.
4 100 W PA. I'll consider this after I have sorted out a Tx antenna.

Antennas

1 PA0RDT mini-whip active (Rx only!) antenna as described in the July/August 2006 issue of *Break-In*. Assembly scheduled for Labour Weekend at this QTH.
2 Rx loop antenna as described above in Lloyd Butler's regen Rx converter article.
3 For transmitting I'm thinking of adapting my existing 80 m inverted Vee for use as a long wire with appropriate loading inductor.

ZL3GIL 630m regen Rx upconverter



ZL3GIL 630 m Rx setup

Measurements

1 LF VSWR meter by GM0MRF (ref. 7). I've built this with a couple of cheap moving coil meters sourced from TradeMe® and will use the 25 W PA to calibrate each meter.
2 RSGB handbook has a chapter devoted to LF. Several metering schemes are described within this chapter.

Some may scoff at the idea of 630 m and sometimes I myself wonder if it's a lot of work for minimal return. I usually snap out of that fugue and tell myself that the journey is the reward! I estimate that I'll be on the air by the end of 2013 and hope that many other ZLs will give it a try. Incidentally, the VKs report that the QRN is not so bad on 630 m, so there's another incentive to give it a go!

Gilbert Best ZL3GIL

References

1 <http://www.nzart.org.nz/h-quarter/infoline/2012-infolines/264-14-dec-2012/>
2 <http://groups.yahoo.com/group/600m/>
3 <http://www.vk2zay.net/article/88>
4 <http://users.tpg.com.au/users/ldbutler/ActiveLoopConverter.htm>
5 <http://fivedash.com/index.php?main_page=product_info&cPath=1&products_id=5&zenid=9744ef99ef9013cd84301d32ea87674e>
6 <http://www.gw3uep.ukfsn.org/>
7 <http://www.g0mrf.com/lfswr.htm>

What the heck is a Dongle?

The FunCube Dongle pro+, a review by Andrew Barron ZL3DW

As many of you will know I have been interested in software defined radio (SDR) for quite a while. I experimented with a couple of 'SoftRock' receivers and eventually ended up buying a Flex1500 QRP SDR transceiver. So I was very interested in the release of a new SDR receiver with the rather unusual name of 'The FUNcube Dongle' which was invented and developed by Howard Long G6LVB specifically to provide a cheap ground station receiver to complement the AMSAT-UK FUNcube Satellite project.

The FUNcube satellite, scheduled for launch in June 2013, is an educational single unit CubeSat developed with the goal of enthusing and educating young people about radio, space, physics and electronics. It will have a linear (SSB/CW) UV mode transponder for amateur radio use. The idea behind the SDR FUNCube Dongle was for schools and students to be able to receive signals from the FUNCube satellite at a minimal cost.

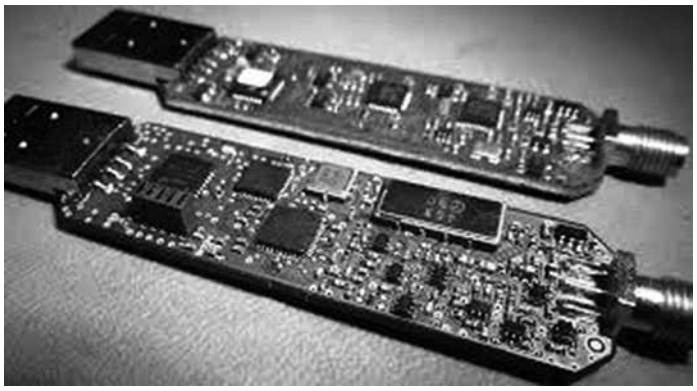
What Howard came up with was revolutionary. An SDR receiver not much bigger than a USB flash drive, that plugs directly into a USB port on a PC. It covers 64 MHz to more than 1700MHz, needs no software drivers and works with Windows, Linux and MAC PCs. The 'dongle' was an instant hit and initial supplies sold out in seconds. Since then thousands have been sold and a few have made their way to New Zealand. But I didn't buy one because I don't need a receiver that works from 64 MHz to 1. 7 GHz. Around June 2012 Howard's project hit a snag, Elconics the manufacturer of the surface mount tuner chip went into receivership and then into liquidation. Howard tried to buy a supply of the remaining stock from the liquidator but was not able to, so he set about re-designing the FUNcube Dongle. The result is an even better version using a completely different chip-set and more than twice as many components mounted on a six layer printed circuit board. The new model is called the FUNcube Dongle Pro+. It is slightly larger and £25 more expensive, but is still very good value at 142. £38 including freight to New Zealand. Due to export orders not having to pay VAT, this is actually cheaper than the price in the UK.

The new 'dongle' is guaranteed to work from 150 kHz to 240 MHz and from 420 MHz to 1. 9 GHz but it typically works from 150 kHz to 260 MHz and 410 MHz – 2. 05 GHz. It has eleven discrete front end filters for different frequency bands including SAW filters for the 2 m and 70 cm amateur bands. The filters are inserted automatically according to the frequency the unit is tuned to. With the 30 dB LNA, the noise figure ranges from 2.5 dB at 50 MHz, to 3. 5 dB at 2 m and 70 cm, and up to 5. 5 dB at 1296 MHz. The noise floor is 8 – 9 dB lower than the old model and the new TXCO is providing frequency stability of around 1.5 ppm which is another big improvement over the earlier model. It even has an internal bias T and can send +5V up the coax to a low noise preamplifier.

Wow an "LF to L Band" receiver with pretty good specifications at a reasonable cost!

Even though I still did not need another receiver in the shack, I decided to buy one. I put my name down on the waiting list in September. On the 17 November I got an email saying that my number had come up and I could place an order, it shipped on the 21 and I received it less than a week later.

The packaging was good. The 'dongle' arrived in an antistatic bag, inside a plastic box, inside a bubble pack, inside an A4 bubble pack envelope. As advertised, the dongle was 'discovered' by Windows as a 'HID' (human interface device – basically a mouse) and no driver software installation was required. But of course some form of SDR receiver software is required. There are several SDR software packages that can be used but the best integrated is SDR#, "SDR Sharp" which can be downloaded for free. SDR# has full frequency control, the usual demodulation and filtering features,



FUNcube Dongle Pro and Pro Plus versions.

recording, and memories but no scan function or notch filters. For other SDR programs that don't have built in frequency control for the FUNcube dongle, a program called FCD+ can be downloaded from the FUNcube Dongle website to manage the tuning and configuration settings.

An initial problem for me was that the antenna connector is an SMA female and I didn't have a suitable cable, so I had to go out and buy an SMA to BNC adaptor. I initially tried the receiver with a short piece of hookup wire inserted (gently) into the SMA connector. I could receive the local 2 m and National System repeaters with no problem and I was able to receive FM broadcast stations but the front end was overloaded even with the wire 'antenna'. With the LNA and mixer gain turned off the FM stereo reception is OK. You can set a wide filter setting and FM stereo in the SDR# software. At HF I was disappointed to see noise spikes right across the 200 kHz wide display. But as soon as I was able to connect the receiver to a proper HF antenna the noise spikes disappeared. I believe that the problem is probably interference from low level leakage of the DDS oscillator or clock signals. The sensitivity at HF seems similar to the Flex radio, so no complaints there. Initially the receiver was well off frequency. This is adjusted by changing a config setting in the software and should only need to be done once. I ended up moving it from the original setting of +128 ppm down to +2.5 ppm using WWV as a reference frequency.

You need a proper antenna at some distance from the shack for good HF reception. Connecting a random length of wire directly to the antenna connector will lead to disappointing results, especially at HF.

The online reviews are rather mixed, with reviews of all three FUNcube variants combined together. Some love it, some hate it, some praise the excellent sensitivity and some say it is extremely insensitive. Several complained about the lack of front end filtering which has been addressed in the pro+ version. My experience is that the pro+ is sensitive, it is possible to switch off the LNA and IF gain using the config software in the FCD+ program or SDR# which reduces the sensitivity considerably so I wonder if that is what confused some of the reviewers. The only quoted sensitivity is '12 dB SINAD NBFM for 0.15 µV

The FUNcube Dongle Pro+ plugs into a USB port.

Multi-band Vertical: "The 43-footer"

by Paul Ormandy ZL4PW <zl4pw@orcon.net.nz>

We moved to a new QTH in 2010 and because of lack of space in our pocket-handkerchief section, it was no longer possible to have the 67-ft/20.6m antenna which worked so well on the low bands. The hunt was on for a good compromise antenna capable of providing a decent signal on 30, 40 and 80 m bands and could at least get a signal out on 160 m (see "Topband" below).

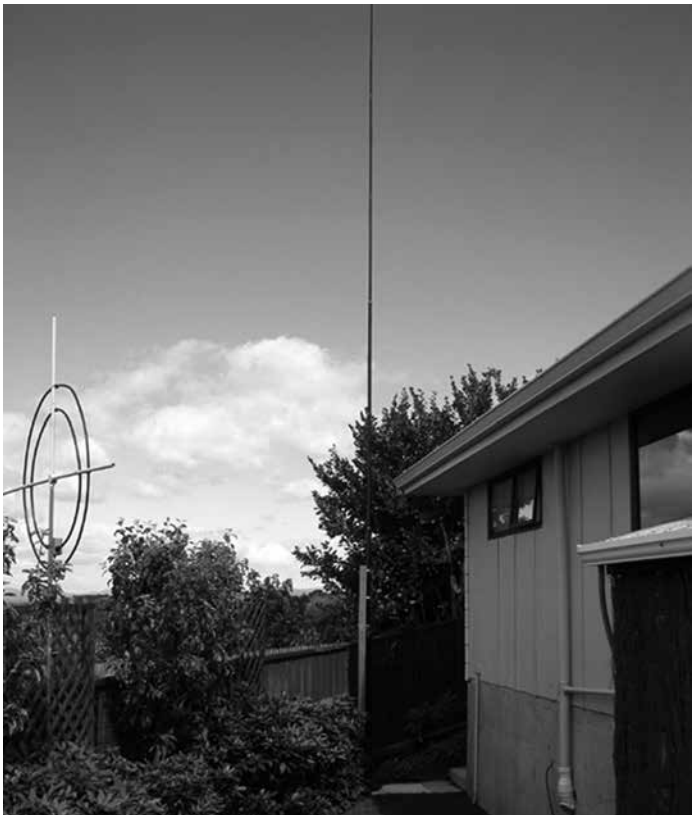
The only spot available for a vertical was in the thin end of a small wedge-shaped back section (the SteppIR beam occupies the thick end). This restricted guying options and testing the new neighbours reactions to guys on their properties was not warranted. Initially, several aluminium antennas of 10 -12 m with various means of loading were tried but they twice bent over in strong winds. Google was called upon for assistance and several articles on short multiband verticals featured the magical "43 footer" or 13.1 m antenna <www.ad5x.com/images/Articles/Match160.pdf>. They are commercially available from DX Engineering and Zero Five antennas.

Installing a 13 m aluminium antenna with the aforementioned issues was never going to happen. Fortunately, there was another option; Fibreglass "squid poles" or windsock poles are being used more and more often amongst the DX fraternity for antennas. The fibreglass poles are lightweight yet very strong and don't need guying. Also because of their weight, they are very manageable and it is a one-person job to stand them up. So far, the very strong winds on this exposed property have failed to damage the antenna, even though it has bent disconcertingly at times!

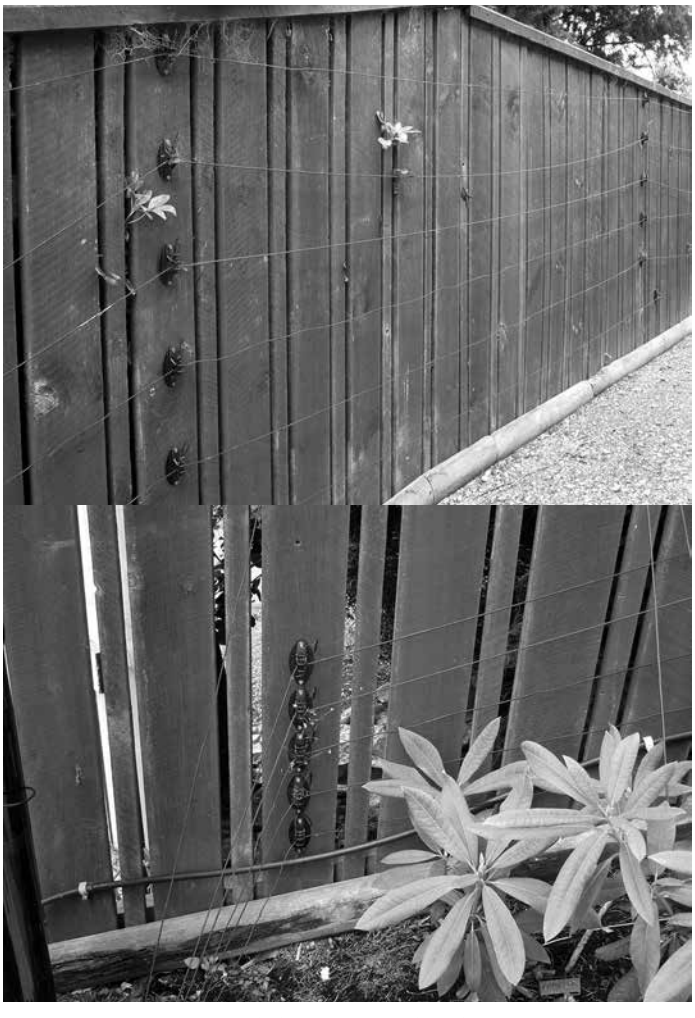
The fibreglass poles are sold on TradeMe® for around NZ$220. Another option is to import them from Australia where they are a lot cheaper, however freight makes clubbing together with a few mates and buying in bulk a sensible option. Then there are the tried and true Spiderbeam poles from Germany which are very strong and used on many DXpeditions these days. See the appendix for supplier information.

And after a DXpedition to Stewart

continued on page 12



The multi-and vertical antenna



The radials strung around the fence.

at 145 MHz'.

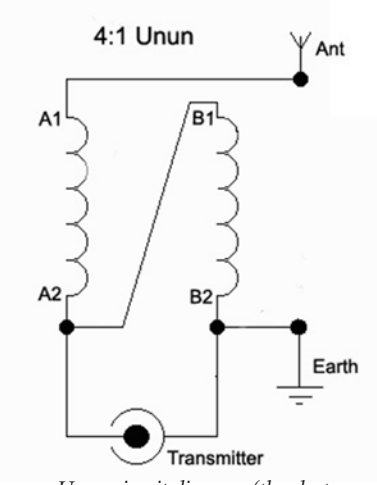
The FUNcube Dongle Pro+ is more capable and much cheaper than most other commercial SDR receivers, so it is a great introduction to software defined radio. Using the Flex1500 transceiver, I found that once I got used to using the mouse driven SDR rather than operating the knobs on my conventional transceiver that going back feels like I am operating blind. You very quickly get used to seeing how wide a transmission is, clicking exactly on each signal up the band, precisely filtering out interference and using super narrow CW filters. The delay caused by the PC processing the signal is annoying though.

Overall at less than $280 delivered to your door, there is no other receiver available that will cover the frequency range that the FUNcube Dongle Pro+ can, or offer a similar level of performance. Yes, you need a PC as well and you do need to download a free program or two. It is not perfect, but it is pretty good and I am sure that more SDR software will support the tuning function in the future. So much 'radio' in such a small package, it is hard not to be impressed.

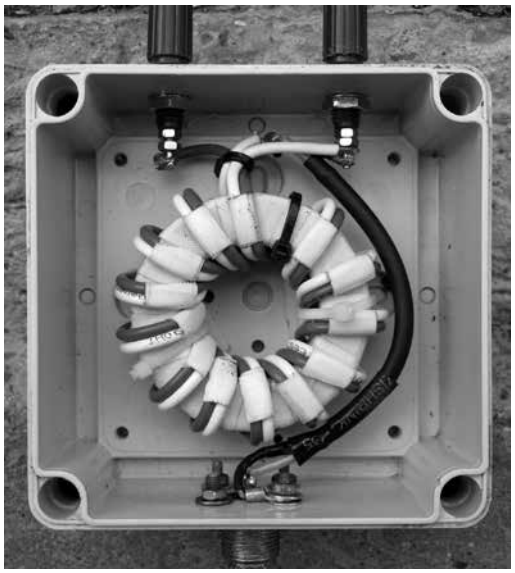
What is a dongle? Traditionally a dongle is a small piece of hardware that plugs into an electrical connector on a computer and serves as an electronic 'key' for a piece of software; the program will run only when the dongle is plugged in. The term 'dongle' was originally used to refer only to software-protection devices; however, currently 'dongle' is often used to refer to any small piece of hardware that plugs into a computer.

References

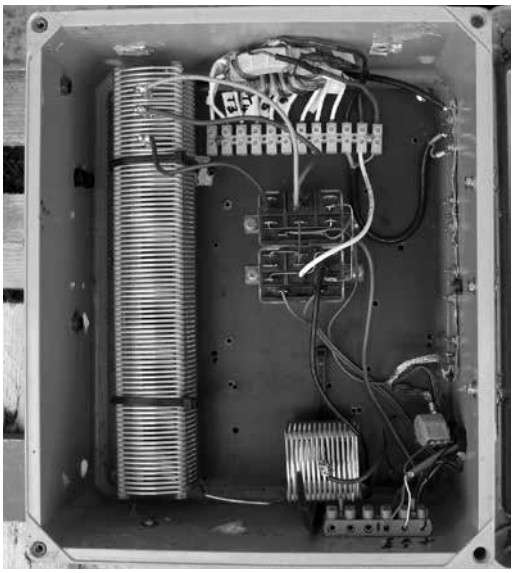
Internet sources including AMSAT UK, <http://funcube. org. uk/, http://www. funcubedongle. com/>



Unun circuit diagram (thanks to Enrico Peroni IV3SBE for the original article at <www.iv3sbe.webfundis.net/html/UNUN.htm#%20>



The toroidal unun.



The tuner unit.

◂ *continued from page 11*

Island in 2010 there was a spare 9 m Spiderbeam® fibreglass pole laying in the basement. It was a long way short of the needed 13.1m which meant another compromise. A neat-fitting 2.4 m PVC pipe extension was attached to the bottom with a 300 mm joint overlap, bringing it to 11 m. To make up the 2 m shortfall, 13.1 m of 1.5mm wire was wound helically down its length. The windings were spaced a good 75 – 100 mm apart to minimse inductance and its associated heating losses. A similar 9 m pole could be extended to the recommended 4 m length with a longer piece of strong PVC pipe, or even double-layered pipe with two tightly fitting tubes or a much longer wooden pole to mount it against.

Spiderbeam sells a 12 m pole which is easily extended with a 1.4m PVC pipe of the right dimension. Spiderbeam is a German company. Since the Kiwi dollar is holding up well against the Euro, they are relatively inexpensive. On the other hand, if you have aluminium tubing to do the job and room for guying that will also make a good antenna.

Since making the original 11 m antenna, an 18 m Spiderbeam pole was bought on TradeMe and extended it to the recommended 13.1 m. Again, it has withstood punishing winds without guying. The pole is saddled against a 3000 x 150 x 100 mm tantalized post concreted into the ground, 500 mm deep.

Because of section size limitations for burying 30+ ground radials, the wooden fence either side of the vertical was used to support two elevated tuned radials for each band. The radials are tuned exactly as you would a dipole for lowest SWR at your freq of choice. You'll note electric fence insulators carrying the wires. High voltages could occur at the tips of the radials so sensible precautions should be taken. These insulators sell in a bag of 20 for $12 at farm supplier stores.

Buried radials would be a better option provided you have the room; the experts recommending 36 minimum spread around a 360 degree circle. At the previous QTH, they ran in as many directions and angles as possible around gardens, along path edges and down the middle of the lawn. There were over 30 buried radials, most being 20 m long and another 6 or so of 40 m.

Matching

The easiest option is a 4:1 unun used in conjunction with your shack's tuner. They're easy to construct and not expensive. See Phil Salas' article on building one at <www.ad5x.com/images/Articles/Voltage%20Balun%20RevA.pdf >.

Initial matching was achieved with unun above, wound on an Amidon FT240-61 toroid with 12 turns.

Note that the toroid is wound with glass tape to improve current-handling capability. Probably over-kill for 500 W max and most construction articles on ununs don't use it. Underneath the unun, there are 3 self-adhesive cable tie mounts which secure the core in place with cable ties. The two wires are taped together to hold them neatly in place though simply twisting them would also work well.

Using the auto-tuner on an Elecraft K3 provided easy match 80 – 10 m. The unun worked very well on 40 and 30 m with no problem working into the Americas, Asia and Europe. On 80 m it was possible to work longpath into Europe with 100 W so the antenna was certainly no lemon... with one exception; Topband.

Topband

With the above unun, the antenna performed poorly on 160 m with the K3's tuner only getting an 8:1 SWR at best. Overseas articles suggested 50 m of coax was required to get it to tune properly on 1.8 MHz which could be difficult to implement in some situations and an unnecessary waste of coax. Again Phil Salas' website offered alternative matching units using a switchable base-loading design.

To minimise losses, the QRO tuner with an air-spaced loading/matching coil and best Q was built. See the AD5X website for more information. Additionally, the output unun is tapped using a design on K0BG's website <www.k0bg.com/match.html#unun> to get a better match on all bands. Relay-switching will be added later on.

An SGC SG-230 automatic coupler at the base of the pole has also worked very successfully. The SG-230 is an excellent coupler and, according to Phil one of the few tuners capable of matching the 43-footer on 160 m, even with a short coax feed.

Appendix; suppliers

Toroids:

South Island Component Centre, Christchurch, P/No. FEFT240-61

Amidon Corp, <www.amidon.corp.com> P/No. FT-240-61 US$9 + shipping

Poles:

Spiderbeam, www.spiderbeam.com, 12 m pole €66.39 & shipping

Pestgard, <www.pestgard.co.nz>(kite poles) 9.2 m pole $218 + shipping (these are the ones sold on TradeMe).

Haverford Australia, <www.haverford.com.au> 10 m pole A$53.90 + shipping.

Parts:

1 x FT240-61 toroid core (see Appendix)
2 x binding posts or M4 x 20 mm stainless steel bolts, nuts & 8 x washers
1 x SO239 socket
1 x enclosure
4 x small cable ties
3 x cable tie mounts
1 x short piece RG58 coax
4 x M3 x 12 mm bolts, spring washers & nuts
1 x small solder/crimp lug
2 x 1.5 m lengths of 1.5 mm2 (use different coloured wires to make identifying ends easier).
6 mm heat shrink to slip over RG58 end
Glass tape (optional)

An introduction to HF Software Defined Radio

by Andrew Barron ZL3DW <zl3dw@nzart.org.nz>

One of the more recent developments in ham radio has been the proliferation of ham radio Software Defined Radio (SDR) receivers and transceivers. SDR is a logical development of the DSP (digital signal processing) technology already found in many ham radio transceivers. It has attracted a large number of devotees and probably an equal number of critics. I say, "don't knock it 'til you've tried it".

But, what is it? How does it work? Is it really better? Do you need to be a computer or technology boffin? Should you buy one or stick to a standard radio? There are a lot of questions to answer and a lot of the information on the Internet is out of date or just plain uninformed, so I have decided to write a series of articles dealing with different aspects of SDR technology.

At the moment SDR is not for everyone but it is going main stream and there is a good chance that the next transceiver you buy will be an SDR. Many hams think SDRs are a PC board kit or a black box radio with no knobs. Take a look at the photo of the Elecraft KX3. It is an SDR, it has lots of buttons and a few knobs, and you don't need a PC to use it. The KX3 was designed for portable QRP operation with a maximum output power of 12 Watts. It has one of the best HF receivers available at any price; coming in 2nd on the Sherwood Engineering list and 5th based on averages of the ARRL lab tests. Baofeng makes a VHF/UHF dual bander that is an SDR. Elecraft, TenTec, Alinco and ADT all make HF ham band SDR radios with knobs. It is becoming cheaper to make medium to high performance radios using SDR technology than to make traditional radios. So I am sure that we will see more SDR based transceivers released in the next few years.

So, now there are two types of SDR; those that have knobs and don't need a PC and those that don't have knobs and do need a PC. The underlying technology is the same and it is radically different to conventional ham radios.

I never thought that I would ever graduate to a radio with no knobs. I believed "the more knobs the better", but I started experimenting with SDR because I wanted one of those fancy band scopes that were on the latest high-end ham transceivers. I purchased a $US38 single band Softrock kit on 9 MHz and connected it to the 9 MHz IF on my old FT-301. I was not about to mess with my newer Yaesu radio, besides its 45 MHz IF was too high for a Softrock kit. It worked very well, I was amazed to be able to see SSB signals as well as hear them. There was a significant delay or 'latency' in the audio from the Softrock compared to the audio direct from the Yaesu radio due to the slow processing in my old Pentium 4 PC. But as long as you listened to either the radio or the SDR it was fine. The results were so impressive that I moved on to a Softrock transceiver kit then I bought a Flex 1500 QRP SDR radio. At that time I still thought that the Yaesu would be my main radio and the Flex radio just a toy to experiment with. Since then I have become hooked on the SDR 'Panadapter' band scope display, the remarkable performance and the ease of using the SDR transceiver. Now when I operate a conventional radio I feel deprived, it feels like I am operating blind.

Software defined radio has been around for a while especially in cellular radio base stations and military radio applications. In the ham radio world, the Tayloe detector was patented in 2001, the high performance SDR (HPSDR) group was formed in 2005 and the first commercial ham SDR transceiver the Flex SDR-1000 was released in 2006. It is still fairly new, but hams have always been ready to adopt new technologies and have frequently been involved in developing it. The first amateur radio satellite was launched only four years after the first ever man made satellite. Amateur TV, digital modes, LF, EME, Echolink, IRLP, APRS, microwave, meteor scatter, repeater operation and even SSB are all examples of what were once new ways to experiment with ham radio.

I guess that SDR is a product of the 'digital age'. We all kept our LP records and some hams refuse to use that 'new fangled' SSB mode, but most of us now own a personal computer, use a digital cell phone and listen to CDs. Even the TV went digital recently! Some people still think that 'vinyl' is better, the world is flat and that SDRs are no good. I can't change that so these articles are for everybody else.

The Elecraft KX3 transceiver is a SDR that can be used without a PC.

When DSP (digital signal processing) was first introduced on ham transceivers it worked on the audio signal after the final mixer. The audio is converted to a digital signal, processed in the DSP chip, then converted back to an analog signal and sent to the audio amplifier and speaker. This method is now referred to as audio frequency DSP (AF DSP). It provided 'high cut', 'low cut', noise filters and often a notch filter. The main problem with AF DSP is that although you can notch out the guy tuning up, 2 kHz up the band, or set the filters so you can only hear the one CW signal that you want to work, the other signals are still within the IF pass band and they affect the AGC action of the receiver. This is a major problem when I work PSK with my Yaesu radio. Every time a high powered local, Russian or Ukrainian station transmits, the weak station I want to work fades away.

To eliminate this problem, the next generation of DSP worked on a low IF frequency. Again the signal is converted to a digital signal, processed in the DSP chip then converted back to an analog signal. IF DSP adds dynamic 'IF width' and 'IF Shift', or a range of pre-set IF filters and often a band-scope to the AF DSP features. Between the IF and the audio section lies the demodulator, or in the transmit chain the modulator. The logical next step is to carry out those functions using digital processing as well.

Definitions vary, but in general terms, if the filtering and demodulation (or modulation) is done using software and is re-configurable then the radio is 'Software Defined'. In other words if the signal is converted to a digital signal and processed using reconfigurable software or firmware in a PC, embedded computer or FPGA (field programmable gate array) it is a software defined radio. But if the signal is converted to a digital signal and processed in a dedicated (not reconfigurable in the radio) DSP chip it is not a software defined radio. This definition is not really adequate anymore because the lines are blurred. Many conventional radios can have firmware updates making them at least partially field upgradable and the Elecraft KX3 is considered to be an SDR even though it uses dedicated DSP chips. These days the definition of what is, and what is not, an SDR is more usually defined by the hardware architecture. Conventional radios use a superhet layout with front end filtering, mixers and IF amplifiers, usually followed by dedicated DSP chips. SDRs use Quadrature Sampling Detectors and Exciters, or Direct Digital Sampling. I will cover how these work in future articles.

SDR in the ham world is evolving rapidly and is splitting into several streams. There are SDRs being developed that look and work like any other ham radio with all the usual

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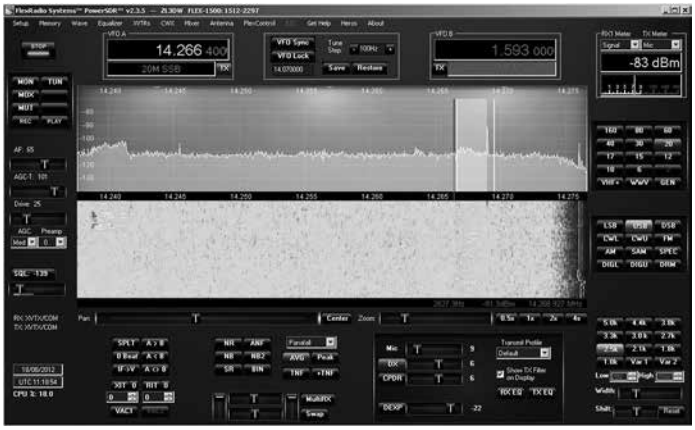
knobs and buttons. They are different on the inside but the same on the outside. They do not need a PC for their operation but in many cases they can be connected to one for software updates, CAT control, band scopes, and digital modes. These radios are being developed because it is cheaper to get high performance levels and a good range of functions using SDR architecture than building conventional radios. Then there are 'black box' radios with no knobs that do need a PC interface. They are mostly SDRs although some WinRadio and Icom receivers are not. The black box SDRs that need a PC, range from simple Softrock kits, to USB dongle receivers, small box receivers and QRP transceivers, up to 100W transceivers. The latest models use direct digital sampling and offer some completely new features such as the ability to monitor several bands at the same time. Both kinds of SDR use the same type of hardware, but the discussion on PC software relates mostly to the black box radios. Most SDRs available commercially are receivers as the real benefits of software defined radios are in receiver performance and receivers are easier to design and build than transceivers. There are some QRP transceivers and only a few 100 W transceivers.

The PC software is a key part of the experience of using a software defined radio. It offers a user interface that is quite different to a conventional radio and you have to get used to operating a different way. It is really no different to learning how to operate any new receiver or transceiver. Most ham radio transceivers produced over the last 20 years or so can be controlled using PC software. This is handy for things like operating digital modes, logging, and CW keyers. If you use CAT (Icom CI-V) or digital mode software you should have no trouble adjusting to using a SDR. But the PC software for an SDR is much more than just an interface to the radio, it performs all or part of the digital signal processing, usually including the filtering and demodulation and in transceivers the modulation. One of the big advantages of the SDR is that you can try different software and most of it is free. New software completely changes the way the radio looks and operates, it can add new



Power SDR showing some weak SSB signals. The receive filter at right is adjusted to cut out the unwanted carrier.

modes and features. It is like getting a whole new radio and it helps to keep your radio completely up to date. If someone invents a better filter or a feature like a tracking notch filter, you can add it at no cost.

First generation SDRs known as 'soundcard' SDRs are cheap because most of the radio is implemented in the PC. In many cases the hardware part of the radio is little more than a QSD (quadrature sampling detector), often with a Si570 chip working as local oscillator to give an extended frequency range. The QSD detects the RF signal and produces I and Q audio streams. The PC soundcard is used to perform the analog to digital conversion and PC software performs the digital signal processing and user interface. Although the performance of this type of SDR is really quite good there are some issues. PC soundcards are not designed for software defined radio. They add noise and distortion when sampling low frequencies below about 100Hz and the maximum available sample rate limits the bandwidth of the displayed spectrum and waterfall. This type of SDR is a direct conversion receiver. RF signals at the local oscillator (clock) frequency are converted to a 0Hz audio frequency and are displayed in the middle of the screen window with signals below the receiver local oscillator frequency shown to the left and signals above the receiver local oscillator frequency shown to the right. Typically the spectrum display from a soundcard SDR will have a large noise spike in the middle of the spectrum display. This does not affect the receive performance when you select signals at other parts of the display, but it is annoying if you are using the SDR as a band scope connected to a receiver IF, because the signal you are listening to is right where the noise spike is displayed. Second generation SDR receivers have hardware analog to digital converters (ADC) in the radio. Second generation SDR transceivers have the digital to analog (DAC) inside the radio as well. Faster and better A/D (analog to digital) conversion allows a wider bandwidth to be displayed on the spectrum display and the 0Hz noise spike is eliminated. Using an A/D conversion with more digital bits representing each sample creates more individual voltage levels so a wider dynamic range can be represented without overload. This allows the receiver to cope with large signals without being insensitive to weak signals.

Doing all of the signal processing in the PC places a load on the computer CPU and the Windows operating system is multi-tasking. Receive and transmit performance could be affected by the specs of the PC and by other software running at the same time. Don't let this put you off, I don't have a particularly fast PC, it is a dual core, and I often run digital mode software, SDR software, a logging program, an Internet web browser, antenna rotator control, and several USB devices with no problem at all. There is also the problem of different PC configurations causing support issues for the radio suppliers. To eliminate these problems and extend the performance of the radios there is a trend in 3rd generation SDRs towards moving all or some of the digital processing back into firmware inside the radios. This is usually done by adding a field programmable gate array (FPGA) chip to the radio board. Sections of the FPGA can be configured to work as a modulator, or a demodulator, a noise blanker or a filter. The digital data streams representing the wide band receive signals are broken down into many narrow band signals called 'bins'. FPGA chips are very good at processing a lot of information in parallel making them ideal for processing all of the bins at the same time.

Tony Parks KB9YIG designed and has sold more than 15 000 Softrock SDR kits. They started out as US$38 single band receivers and now there are transceiver and multi-band options available. He is to be commended for his efforts, I can't understand how he can sell them so cheap and I am sure there is little or no profit margin. They are great if you want to build your own, but I think there are now better options. Some hams are using USB Freeview DVB-T TV dongles containing the RTL2832U chipset as SDR receivers. These are available online for about US$20. Note that the software for these is pretty primitive and you must find one that uses the RTL2832 chip. They only have an 8bit ADC so the sensitivity is a bit limited and they are susceptible to overload, but they are cheap. I believe a better option is the 'Funcube Dongle pro plus', which is also a USB dongle but it was specifically designed to be a ham radio SDR. It has much better performance than the TV dongles with 11 front end filters, good sensitivity and excellent noise figure specifications. It covers an amazing 150 kHz to 260 MHz and 410 MHz – 2.05 GHz. An "LF to L Band" receiver you can put in your top pocket. The Funcube Dongle pro plus is excellent value at £142.38 ($NZ291) including freight to New Zealand. Due to export orders not having to pay VAT, this is actually cheaper than the price in the UK. Another good entry level option is the Flex1500 QRP transceiver. It costs about the same as many SDR receivers and band scopes but includes a 5 W transmitter.

Next issue we will get into more detail on how SDRs work and what makes them different. In the meantime you can contact me to ask questions at <zl3dw@nzart.org.nz> or check out my web site at <www.qsl.net/zl3dw>. Also check out SDR blogs at RoaringStar.com, N8MSA and N9VV and excellent YouTube videos by Nige Coleman G7CNF. βi

Satellite Orbits

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After producing 41 columns for *Break-In* Andrew has decided to move on to other things. A record like that is a hard act to follow. Thanks Andrew for your dedication over quite a number of years. I have agreed to take over producing the column for the foreseeable future.

I should probably start by introducing myself. First licensed as a teenager, my interest for many years was chasing DX. My peripheral interest in satellites became more immediate running a scientific satellite tracking station for a number of years. During this time I had a few contacts through AO-07 but they were few and far between. Seven years operating in the Pacific Islands where every day was pile-up day "cured" me of the DX bug and on return to New Zealand I took an extended break from ham radio. Eventually, as is often the case, the bug bit again and I started looking for a new ham radio challenge. Satellite operations seemed like a good place to start and as it turned out for me, it was a fortunate choice. Putting together an efficient satellite tracking system involves many aspects of the amateur art: electrical, mechanical, construction, equipment integration, HF, VHF, UHF, operating, computer programming and on top of that the endless opportunity to experiment. In fact you could almost say I am an enthusiast.

Like most aspects of amateur activity of course, satellite operating lends itself to many levels of sophistication. It is not necessary to have an all singing, all dancing, fully automated tracking station to become involved. On holiday I get some aluminum from the local hardware store, construct a simple hand held antenna, point it in the general direction of the satellite and have contacts almost from horizon to horizon. I have even had a contact with a mobile station that had no idea that from my perspective we were having a satellite contact. He simply called me on my 2 m satellite uplink frequency and assumed we were having a simplex contact. I heard him through the satellite on the 70 cm downlink frequency and we had a QSO. Needless to say there was some confusion for a time. What this demonstrates is that getting a signal through the satellites is not particularly difficult. On the other hand I would not want to create the impression that serious satellite operation is a trivial matter. Antenna tracking, cross-band duplex operation, Doppler correction (which is different between the uplink and the downlink) and weak signal reception (mast head preamps etc.) is just the starting point. Best not to go down that track unless you like serious challenges.

So where to from here?

It is hard to know how much interest there is in satellite operation in New Zealand. Judging by on-the-satellite activity the answer would seem to be not much. In the first eight months of this year only 11 out of some 300 satellite contacts were ZL stations and these were with one station, Murray ZL3MH. The rest were with VK stations where there is considerably more satellite activity. On the other hand, in the latest *Break-In* readership survey almost 25 percent of respondents said they read Satellite News so I guess all is not lost (six listed Satellite as their favourite mode.) There are certainly a number of potential ZL satellite stations and on rare occasions I work them. Over the years there have also been stations that appear and are very active for a month or two but then disappear and are not heard from again. My hope would be that a few of these stations would blow the dust of their satellite gear and get back on from time to time. This would help reduce the serious imbalance that exists between ZL and VK stations on the satellites these days. If some new stations can be motivated to give it a go then so much the better.

Current activity

The only routinely usable satellite in the morning at the moment is FO-29 (uplink 145.950 MHz, downlink 435.850). The others (VO-52 and AO-07) are too early for the VK stations. Fortunately FO-29 is one of the better satellites with consistently solid signals. In the evening all three satellites are at reasonable times for ZL/VK.

AO-07 has reverted to it's switching mode with the so called A and B modes available on alternate days. (A is 145.900 MHz up and 29.450 MHz down, B is 432.140 MHz up and 145.950 MHz down.) There is very little mode A activity but mode B is always popular. Its higher orbit means that it covers all of VK and ZL on most passes to the West.

Coming events

The next satellite to play with looks like being the UK satellite FUNcube-1. This is scheduled for launch in November and has a 435 to 145 MHz linear transponder on board. As with most of the 10 cm cubed, 1 kg satellites these days FUNcube-1 packs considerable punch into such a small volume. Apart from the amateur transponder there is a telemetry downlink based on a "materials science experiment" and aimed at primary and secondary school students. As the AMSAT-UK website points out "FUNcube-1 is a complete educational single CubeSat project with the goal of enthusing and educating young people about radio, space, physics and electronics." The projected orbit of 600 to 700 km, sun synchronous (similar to VO-52) should give good coverage of most of VK/ZL and as far as VK6 on optimum orbits.

In conclusion, any contributions to this column or suggestions as to content would of course be gratefully received. Email to <zl2bx@nzart.org.nz>.

73 *Alan ZL2BX*

CQ-DATV

CQ-DATV is a free new ATV magazine, covering news, Reviews, Software and for publication of constructional projects.

The Publication started in April this year and is growing in popularity. Already 5 issues have been published making it a bi monthly publication and if all goes well the editorial team would like to ramp it up to being a monthly magazine

It is a free publication and it downloadable from <www.CQ-DATV.mobi>, you do not have to register or leave your email address, just download and enjoy.

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A simple milti-platform reader (Platforms: Win32, Linux, Android) is CoolReader <http://sourceforge.net/projects/crengine/files/> This is small and fast. Both the Chrome and Firefox web browsers have ePub reader plug-ins available, so you can use your browser to read our publications.

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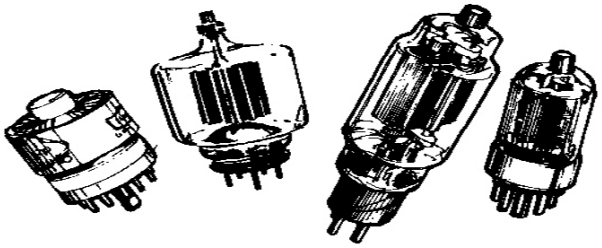
73 Trevor G8CJS

Thermionic emission from filaments and cathodes

by Peter Loveridge ZL1UKG



Gary Bold poses a new problem in each column he writes. The March/April issue asked about 5 V rectifiers and 6.3 V for other functions. Why was 6.3 V chosen as the filament voltage for the tubes that it powers? These tubes would all have been "indirectly heated" (with athode separate from the heater), but the rectifier tube has a 5 V filament and is directly heated with no cathode. Why was 5 V used instead of 6.3 V and why was it directly heated?

I grew up using valves because transistors were too expensive. Silicon rectifiers were coming on the scene so 5 V was becoming a matter for history. Texts I had lying around did not directly answer his question so I turned to the internet for help as my interest had been aroused. I find that I have to make notes while I investigate or the facts will evaporate before I get a clear understanding of my target. There is a discipline to writing which forced me on when I couldn't prove a link from one statement to the next. I apologise if there is not quite everything you wanted to know but were afraid to ask here. I also did not find the definitive answer to Gary's question. I hope that you will enjoy my path of discovery.

To increase efficiency in the emission of electrons a tungsten filament was coated with carbonates of barium 60% and strontium 40% [2]. This is heated to a high temperature and the carbonates are reduced to the oxides required in the activation of the filament surface and CO_2 gas. A molecular layer of barium metal on the oxide surface (ascribed to electrolysis of the oxide as current flows through it) has a low work function and releases electrons into a "space charge" around the filament [1]. The 'gettering' process occurs after this, reacting with the free oxygen. The oxygen eventually reduces the emission to end-of-life by coating the barium layer. Experimental investigation showed that both the barium and oxygen would diffuse into the porous oxide layer. Oxygen beneath the barium increases activity, above the barium decreases activity. The getter would react with free gas and leakage through the wire seals in the glass envelope. It does not react with inert gases.

The getter is made from barium oxide in combination with a reducing agent [2]. Barium is a chemically reactive metal. The getter is held in a cup away from the active structure and activation involves induction heating the getter to initiate reduction of the oxide with the metal deposited like a mirror like surface on the glass envelope. An exhausted getter deposit looks grey when the valve is going "soft".

An early *RCA Handbook* [3] says that indirectly heated filaments were more efficient than indirectly heated cathodes when batteries were common in the running of radios. They would operate at 700 – 750°C (dull red). They were generally 2 V to operate from lead acid chemistry cells. Later designs introduced 6.3 V for 3 cell operation. This began once the heater-cathode had been introduced to eliminate the effect of AC operation which modulated both the temperature and hence space charge intensity and the voltage between the filament and grid 1. Manufacturers could now hold one valve for both AC and battery power. Cathodes are nickel tubes coated in oxides.

The earliest AC heater cathodes were 2.5 V @ 0.8 A where the lowest practical AC applied to filaments still caused hum problems. The alternative was to use massive filaments such as in the type 2A3 (2.5 V @ 2.5 A) had sufficient thermal mass to show little temperature modulation. It was recommended to use a centre-tapped filament transformer to reduce modulation of the grid potential. With an amplification factor of 4.2 (low Mu) very large grid voltages had to be applied to the grid to reach full output so the introduced hum was only a small percentage of this. Designs were usually push-pull where the introduced hum would largely be cancelled.

There were other filament voltages in early use. Type 01-A = 5.0 V, type 10 = 7.5 V, type 22 = 3.3 V.

There are warnings about operating oxide emitters at saturation current which is dependent on the filament temperature. At saturation the space charge is depleted and free oxygen can be released from the oxide surface which rapidly reduces the efficiency of the barium layer as an electron emitter. This would seldom be a problem for battery powered filaments but had to be managed in mains operated equipment. Running oxides at excess temperature also degrades emission by evaporation of oxygen. The balance is getting sufficient emission while running at a low temperature. Little emission is gained by overheating.

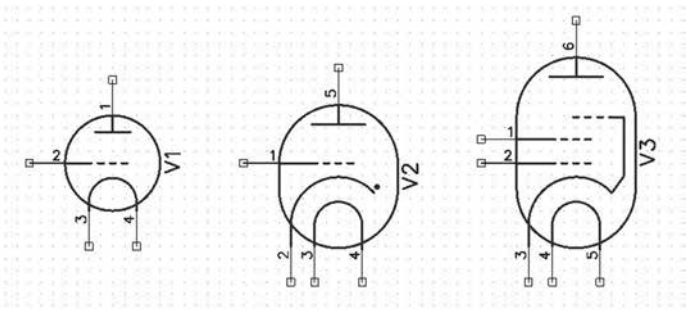
Oxide coated filaments and heater cathodes are used up to applied voltages of 1000 V or so. Above this value the electron energy near the anode is sufficient to ionise any gas molecules present in an imperfect vacuum. There will be a heavy positively charged ion repelled from the anode and attracted to the cathode. The ion impact on the oxide coating causes damage to the barium layer and emission is reduced. Thoriated tungsten is not susceptible to damage as the oxide layer is so is used at higher voltages. The penalty is higher heating power required for emission as the work function of thorium is higher than barium. About 1.5% thorium oxide is added to tungsten when making filament wire. The wire is carburised and the tungsten carbide formed reduces the evaporation rate of thorium and prolongs the life [4].

About 1960 cathode fabrication by sintering nickel powder onto the nickel tube surface to form a sponge like matrix was developed [2]. The nickel matrix is impregnated with a barium-strontium oxide coating. The resulting cathode requires more heater power, operating at about 830'C but is resistant to heavy ion bombardment and has a reservoir of emissive material which prolongs operating life. It can be used up to about 3 kV.

There are various opinions about the efficiency of oxide surfaces: RSGB = 50 – 150 mA / W at 680 – 780'C [5] to Eimac® = 200 – 300 mA / W [4] to Wikipedia = 500 mA / W @ 830'C (cathode type not specified). A thoriated tungsten filament operates at about 1630'C for emission of 70 – 100 mA / W [4].

Power tubes are operated with high heating power. Guess work follows.

The direct filament was more efficient than a heater cathode. 5 V @ 2 A was a standard value which gave high emission current without surface damage by under voltage (temperature) leading to saturation. A large space charge resulted in low voltage drop across the rectifier and better regulation of supply voltage to the equipment. There is one rectifier and many anode current consuming tubes with lower individual emission requirements. At 5V the AC voltage on the filament would not unbalance



the load sharing by the two anodes too much and not impress much additional ripple on the high voltage DC from the power supply circuit. A separate winding had to be used on the transformer as high insulation values were not available between filament and cathode.

This argument is undermined by comparing type 80 (5 V/2 A filament) with type 83-v (5 V/2 A heater cathode) which had 2 times the maximum current capability (1934). Why didn't this valve become more common? RCA claimed that the superior 83-v performance was due to close cathode – anode spacing. By 1940 the capability had been reduced to 1.4 times type 80 in the light of experience. This is not to be confused with type 83 mercury vapour (5 V/3 A filament) rectifier. It is interesting to read the application note about the fast rise time of the output current when gas ionisation occurred at about 15 V forward potential. Protective filters were needed to keep buzz out of sensitive equipment from both RF and audio frequencies.

Additional information about grids

Barium evaporating from the oxide can be deposited on the grid and other surfaces in the valve. In power tubes the grid temperature can rise when current is drawn as in Class C. Barium on the grid can help it to emit electrons. Gold plating has a high work function and can be used to reduce emission [4].

Low-Mu triodes could deliver high anode current at low anode voltage (high efficiency) due to the accelerating effect of the grid. The penalty was higher driving power. RF power amplifier design followed valve design and grounded or passive grid designs appeared to take advantage of high-Mu by about 1970 *(ARRL SSB Handbook)*. Driving power went up again but the stability and linearity benefit outweighed this.

Some electrons will be intercepted by the screen grid giving up their kinetic energy to the grid and heating it. The arriving electrons will also dislodge electrons from the grid surface which may be attracted to the higher potential anode and make the grid appear to have the opposite from expected electron flow. Shunt regulation is suggested.

High energy electrons hitting the anode will dislodge electrons which are mostly attracted back to the anode. During amplification where the waveform reduces the anode voltage towards or below the screen grid potential these electrons will be attracted to the screen grid and appear as a large increase in screen current for part of the cycle. The pentode was designed to overcome this by repelling the electrons back to the anode. The Beam Tetrode was invented to get around the pentode patent. Some beam tetrode designs like the KT88 (Kinkless Tetrode) address screen problems by improved design geometry. It is still sought after by hifi buffs and musicians. Beam forming allowed the anode voltage to swing lower before screen current rises. This results in greater efficiency in power amplifier design.

The *ARRL Handbooks* have current designs up to 3 kV with cathodes and 4 kV with filaments where high RF power is required, but solid state designs may soon become cheaper. To protect your expensive power valve from thermal shock failure some authors have suggested current limited filament supplies. In one example for a 4CX1000A (6 V, 9 A) with current limiting at 10 A it took 30 seconds to leave limiting when starting from 0.08 ohm cold [6]. A regulated supply also allows the filament voltage to be reduced slightly in idle periods, extending the life of the valve. βi

References

Important information for this article came from : Google for "oxide coated filaments".

1 Abstract from the *Journal of the American Physical Society* Vol 34 Issue 10 published Nov 1929, found in the Physical Review Online Archive. The whole paper must be purchased if you wish to see how the experiments were done.
2 *RCA Transmitting Tube manual* 1962
3 *RCA Receiving Tube manuals* 1934, 1940, 1961
4 *Care and feeding of Power Grid Tubes*, Eimac, 1967
5 *Radio Communications Handbook* 5th edition, RSGB 1977
6 M. Mandelkern K5AM, A luxury linear, *QEX* May 1996, 7 June 2013

Awards

Awards Manager: Alan Chapman ZL3GX
<awards@nzart.org.nz>

Next year the Kordia National System 2014 award will be running and organised by the Hamilton Amateur Radio Club. The award will be using the Maidenhead Locator Squares and any contacts for the KNS award can also be used for the NZART Century Award. The basic Century award only needs 100 different squares.

Kordia National System Award 2014

Maidenhead Locator Squares KNS Award is presented by the Hamilton Amateur Radio Club, Branch 12, NZART. This is a fun award available to all amateurs to demonstrate the coverage and use of the National System.

- All details for this award are available at: <www.zl1ux.org.nz/nsaward.html>
- The award will run from 1 January 2014 to 6 February 2014
- Applications close on 6 March 2014. Send to;
- The Award Custodians, Hamilton Amateur Radio Club, PO Box 606, Hamilton 3240. Or Email to: <branch.12@nzart.org.nz> with KNS2014 in the subject line.

NZART Century Award

Basic requirements. This award is based on the Maidenhead Locator System. The award is open to all amateurs and SWLs. One hundred different sub-squares are required for the Basic Century Award. (100 sub-squares)

- Certificates are available for 100, 500, 1000, 1500, 2000, 3000 & 4000 sub-squares.
- Each contact must state the full six digits of the Locator position, eg, RF66HK.
- Eligible contacts must date January 1, 2000 or later.
- Any operator on a "Century Award DXpedition" whether mobile or portable may claim the sub-square for their own credit.

Note. All contacts must be from the New Zealand mainland or surrounding islands. Google maps <http://f6fvy.free.fr/qthLocator/fullScreen.php> will show your locator.

Cost of certificates $5.00 each.

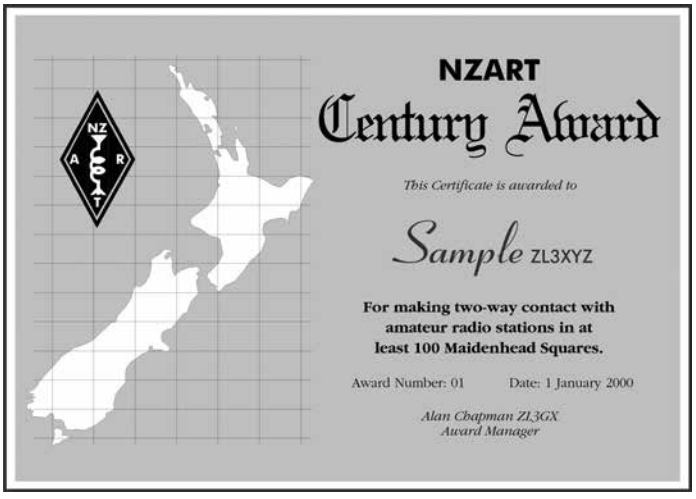
Applications to:
NZART Awards Manager.
PO Box 1733.
Christchurch 8140.

Club Awards

Clubs running short-term awards or new awards should send details of the award to me via email or at my *Call Book* address or the address below. Remember that *Break-In* is only published on even months and copy, including, if possible, a copy of the certificate, for inclusion, should reach me by the end of the even month.

The Awards Net runs on 80 m, 3.677 MHz every night from 0800 UTC every night of the year. Every one is welcome to join in especially if you are mobile and in a rare county or district.

NZART Awards Manager, PO Box 1733, Christchurch 8140, <awards@nzart.org.nz> <www.nzart.org.nz/activities/awards/>


NZART
Century Award
This Certificate is awarded to
Sample ZL3XYZ
For making two-way contact with amateur radio stations in at least 100 Maidenhead Squares.
Award Number: 01
Date: 1 January 2000
Alan Chapman ZL3GX
Award Manager

The Morseman

Gary Bold ZL1AN
<morseman@nzart.org.nz>

Changing Technology

At the last NZART Conference, a group of us old-timers were examining the new HF transceivers on display, having built-in automatic antenna tuners, DSP processing, adaptive noise reduction, variable bandwidth filters, voice recorders, iambic keyers! We were impressed. On the other hand, the alarming array of knobs, buttons and legends on their front panels seemed daunting (what do "AGC MID", "XFC", "TS" do?) The "simplicity" that we once knew had gone.

One of us nostalgically recalled the FT-101, which arrived in New Zealand in the 1970s. This revolutionary transceiver was much coveted by impecunious young Hams of my generation. But consider the steps necessary to put an FT-101 on the air[1]. Firstly, you had to switch plate power and heaters on, wait 15 minutes for the VFO drift to (sort of) stabilize, peak the pre-selector, then iteratively adjust the plate and loading pi-coupler controls in conjunction with the carrier power for optimum output. If this took more than about 10 seconds, it was recommended that you let everything cool off a bit before continuing. And since it used fairly high-Q coupling circuits, you usually had to re-tune whenever you moved more than 50 kHz or so on 80 metres.

Warm-up drift was a major problem with these old transceivers. Some drifted 1 - 2 kHz from switch-on in the first 15 minutes, and slowly and randomly from then on. The first solution proposed to minimise this, the "Huff and Puff VFO stabiliser" was published by Klaus, PA0KSB, in 1973, and was immediately adopted by many home-brewers.

The "Huff and Puff" method

Klaus' original paper was somewhat cryptic, and subsequent writers clarified and expanded it. Hans G0UPL, collected key contributions on his website.[2] It's usually assumed that Klaus thought the "Huff and Puff" idea up himself, but Harry ZL2APC (now a silent key) pointed out shortly afterwards that the principle had already been patented in 1967, both in the UK and New Zealand, by Plessey Ltd. It's possible that Klaus was aware of this and just adapted it for Ham use.

It's also well-known to control-system engineers, who call it "Bang-bang feedback control"[3]. The idea is that a system is constrained to move between two defined states by binary, and not proportional feedback. Switched-mode power supplies also use this principle.

Figure 1 shows a simplified block diagram of the original implementation. The drifting VFO to be stabilized is shown at top, with its tuning capacitor, marked CVFO. Its output waveform toggles a binary counter, gated on for an accurately timed count interval derived from a stable crystal oscillator, which is assumed drift-free. If the interval was one second, a long counter would then register the VFO frequency in Hz. But only the least-significant (fastest-changing) bits of the count are needed, so a four-bit counter is adequate. The digits will wrap around many times during a count period, but this doesn't matter.

The least-significant bit (marked "1") toggles once per VFO cycle, and the most-significant bit ("8") toggles every 8 cycles. At the end of the count interval, the state of this bit is read into the binary latch, and appears as a high (if "1") or low (if "0") voltage at the input of the RC filter at its left. The counter is then reset and cycle-counting starts again, while the latch output remains in the state set by the last count.

If this state is "1", the capacitor C charges slowly up with time-constant RC, typically an order of magnitude larger than the count time. This increasing capacitor voltage is applied to a reverse-biased varicap diode through the 100 kΩ resistor, slowly decreasing its capacitance. The varicap is connected across the VFO tuning capacitor via the 10 pF coupling capacitor, we need only a small change, and hence the VFO frequency slowly increases.

The Bang-bang cycle. Eventually the MSB (the "8" bit) will toggle to zero, be grabbed by the binary

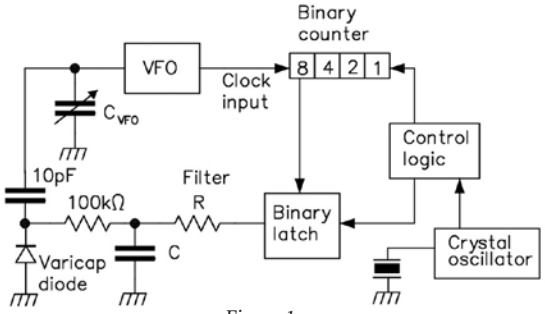


Figure 1.

latch, output as a low voltage to the filter, and the varicap voltage will start to ramp down again, increasing its capacitance, decreasing the VFO frequency. At the lower threshold frequency, this bit resets from "8" bit to "1", and the frequency ramps up again.

Thus the VFO frequency initially drifts slowly to the nearest lock frequency, and thereafter follows a saw-tooth variation between upper and lower limits which, in this case, will be 8 Hz apart. The resulting frequency stability will be that of the crystal oscillator.

This is a simplistic explanation, and there are many variants. Other circuits have been evolved which lock faster and more reliably. You can even buy a kitset[4] which can be simply interfaced to an existing VFO. This uses a PIC microprocessor and gives lock frequencies 10 Hz apart. Has anybody built one of these?

Feedback

Basil ZL1TOW, sent extensive comments on the section I wrote last time concerning both my TS-50 battery failure and thoughts about virus protection. He castigated me for putting the replacement battery back in, even though it apparently recovered overnight (as an ex-student of mine, he has the right to do this.) He even mailed me another, fresh, replacement battery for insertion when the questionable one failed; so far it hasn't.

Basil also gave sage advice about ant-virus software, installing programs, cleaning the registry, and disk backup systems. His recommendations were so interesting that I exhorted him to put them in an article for *Break-In*, and he has promised to do this.

Several others commented on my Morse evaluation software "Doktor" which I described in the last column. Martin ZL2MC said:

"Many years ago in the early 60's I was in a group of 20 or so for the first Marine Radio Officer's course run by the South East Essex Technical College. An ex-sea-going operator was employed as an experienced technical tutor and Percy, an ex-Portishead HF Radio operator, as a morse tutor. He had been operating for so long that the ends of his sending fingers were rounded like a frying pan!

"The college had a Morse classroom with individual booths containing a Marconi key and a pair of SG Brown® Type F headphones. A console on the front desk enabled Percy to send to all the booths or listen to any key. Percy's Rule One, on the very first day, was "nobody touches a key until you can receive properly" so we slogged away two mornings a week for the first term learning everything, numbers, punctuation and accented letters until in the second term we were finally allowed to touch the key.

"Everybody had a copy of the Post Office '*Handbook of Wireless Telegraphy*' and Percy would send slowly from a selected page; we could hear Percy in our headphones but no side tone, only key clicks, and we had to send in unison, with the correct wrist motion. The keys were mounted on the front of the horizontal desk to eliminate "American" style of forearm-on-the-desk sending. Percy would selectively listen to our sending and comment afterwards that "dashes were too short" or something like that, giving hints on why and how to cure it - larger gap, stronger spring etc. He also taught that you don't rely on the spring to lift the key, you pull it up with your thumb. (As an aside, Percy's experience allowed him to roll a cigarette with his left hand while sending with his right!)

"Percy was joined for the last term by Hank, a Dutch operator from the Scheveningen HF radio station, who was our second-year tutor. The first day Hank sent us something for us

to copy and then listened as we sent it back to him. "Good heavens" he said, "you all sound like Percy!" This was the first we had heard of 'operator's signature' but Hank quickly obtained a Creed perforator and sender. Now we realised that Percy's morse did indeed have 'character', while the Creed morse was sterile in comparison; but it was 'perfect'. Soon we learnt to send in unison with the Creed. This sender was an excellent tutor, as the speed could be increased as we improved. Hank would walk around the room watching our style or lack of it.

"At the end of the second year all the remaining students passed the First Class Operator's morse test at 25 wpm plain text and 18 wpm code groups.

"To sum up, I think the main techniques for learning to send 'better' Morse on a straight key are to not send until you can receive, don't try to send too fast for your own abilities (keep a wide gap), don't listen to your own side tone, the correct keying grip and arm movement and key along with a perfect sender. There are plenty of software programmes that send perfect morse; you can download the texts and send along with that. Get a good heavy key and fix it down solidly, my Amplidan key is screwed down to a 4 kg block of schist! Above all, practice, practice and practice!

My program "Teach" allows you to send in synchronism with perfectly-sent Morse to practice in the way Martin describes. It provides many sample texts, and it is easy to add others. It's received favourable reviews from around the world[5].

Spacelab Video

Two columns ago I discussed Ham radio operation on the US space shuttle program. Kelvin ZL3KB writes:

"I noticed you mentioned your friend Tony England in your column. I worked with Tony on Spacelab II, as part of the ground crew for a Solar physics telescope experiment. We were based at Houston mission control during the mission mentioned in your column.

There was a Ham radio contingent at Houston during the nine day mission, they set up an operating desk and the astronaut wives hovered around, trying to talk with their husbands, which was the only way they could.

Once we had an unexpected "window of opportunity" coming up for operating our experiment, and I was frustrated trying to get some commands through to the crew, but all the Comms channels seemed to be busy. It happened that the spacecraft was passing within radio range of Houston, so I rushed outside with my handheld and gave them a call on 2 m!

It would have been a nice story if I'd got an answer, but the crew were all busy, as they were most of the time. That seems a long time ago now!"

A great video has been uploaded by NASA about this mission[6]. At 11:30 (minutes/seconds) you can see Tony with the SAREX equipment. It's a good and often humorous illustration of life in a gravity-free environment.. Shortly after the SAREX shot there's a sequence showing the interaction between a magnet and pencil, which has a surprising result. For those of you who are teachers, this is an excellent video to show to a Physics class when introducing Newton's three laws of motion.

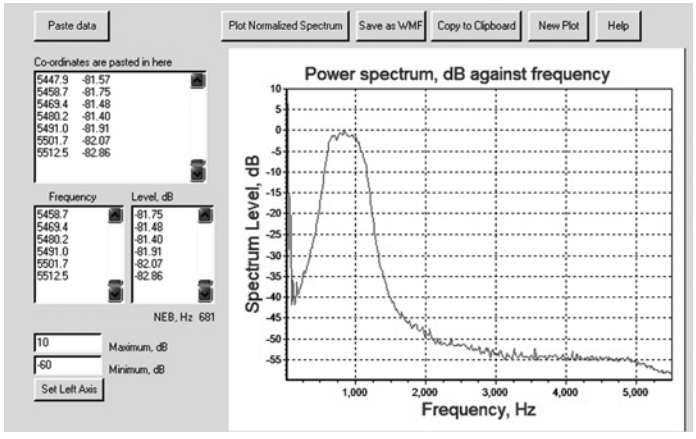


Figure 2.

Checking the receiver passband.

Periodically I get a query along the lines of "Is there a simple way to plot the frequency response of my receiver without an RF signal generator and oscilloscope?"

There is. If you have a Windows computer, you can use two programs downloadable from my website[5]. These are Con ZL2AFP's "*Spectrum Analyzer*" and my program "*Plotspec*". No hardware is required except a lead to connect the phone or speaker output of your radio to the microphone input of the computer. My website recommends using a program by Paul Kellett to grab the spectrum, but Con's program is better. Help files are supplied explaining the steps required. Under Windows 7, both programs will probably need to run in compatibility mode for Windows XP, service pack 2.

The passband is recorded using Con's program, energised by white noise from an unoccupied portion of RF spectrum. Since noise is random, typically several hundred spectral samples have to be averaged for a smooth plot, which you can view as the plot builds up. For a better, normalised plot which can be cropped and re-sized, capture and paste this plot into "*Plotspec*". Figure 2 shows a typical result, the CW passband of my TS50. The baseline, at around -55 dB in the upper portion of the spectrum, results from noise generated in the audio stages and doesn't reflect the true skirt behaviour of the filter.

This Month's Problem

Figure 4 shows a screen-shot of a frame from the Space shuttle video I mentioned earlier[6]. At about 12:20 (minutes:seconds) the mission commander, Gordon Fullerton, performs an interesting manoeuvre which is only possible in a gravity-free environment. What is the physical principle involved? Submit short essay answers, preferably with explanatory diagrams.

Figure 3.

Last Month's problem

Nobody, including me, has been able to give an answer, which is most unusual. I therefore re-state it. See figure 3. "Many meters from the 40's era have a marking showing "F.G.X.4" or similar on their faces. Do you have any idea what this means?"

References

[1] FT-101 page <http://www.qsl.net/nw2m/ft101.html>

[2] Huff and Puff Oscillator Stabililizers <http://www.hanssummers.com/huffpuff/library.html>

[3] Bang-bang control. <http://en.wikipedia.org/wiki/Bang%E2%80%93bang_control>

[4] X-lock VFO stabilizer <http://www.cumbriadesigns.co.uk/x-lock.htm>

[5] Download programs from <http://www.qsl.net/zl1an/index.html>

[6] Space shuttle video <http://www.youtube.com/watch?v=s-__jbxdKOU>

Figure 4.

Digital Modes

Murray Greenman ZL1BPU
<zl1bpu@nzart.org.nz>

I have quite a few goodies for you to enjoy this month – digital antennas, SDR devices, a book review, and the Android operating system yet again. I also have news of some really great DX using DominoEX.

DVB-T Antennas

Like me, you probably have a jaundiced view of advertising which suggests that the product is 'digital' when clearly it could just as easily be an analogue product (for example a pair of headphones, a stereo amp or an antenna). I've recently had my attitude modified rather as a result of messing about with digital TV and digital audio. On my roof I have two TV antennas; an older multi-band 'analogue' TV antenna, and a recent 'digital' antenna with good low-loss feeder installed for DVB-T. The older antenna worked fine for analogue channels, but wasn't very good for digital TV, hence the new one, which was good for both (although UHF only). Why, I wondered? I also have an older low-noise TV preamp based on the Philips OM-230 hybrid chip, which has excellent specs, and I found that when I used that on either antenna, analogue reception was better, but digital reception was worse!

I checked the signal levels with my TV field strength meter, and couldn't see any reason for this difference. In fact the signals were stronger on the older antenna. I also checked the signals on my discone antenna (pretty much flat from 25 MHz to 900 MHz, but again no good for DVB-T), and again couldn't see any reason. So I fired up the trusty RTL-SDR receiver (SDR#) and then the problem became very obvious; the digital TV signal on most antennas was not flat with frequency! The digital TV transmissions are nearly 8 MHz wide, and DAB nearly 2 MHz wide, and apparently the phase change with frequency and various reflection effects cause the received signal to have deep notches, which must seriously upset the receiver. In Figure 1 you can see the first 2 MHz of the local TVNZ transmission on channel DTV28, as received on the 'analogue' TV antenna.

You can see the sharp lower-frequency edge of the transmission at 534.2 MHz, but notice how the signal strength across the top of the signal varies by more than 10 dB, and at about 536.3 MHz (at the far right) there is an even deeper notch. As I tuned across the signal, this was the general result, many small and some very deep notches. When I changed to the 'digital' antenna, I was stunned to discover that while the signal strength was similar, the signal was flat across the whole signal, within one or two dB! Figure 2 shows the whole of Kordia's Auckland DAB multiplex at 239.2 MHz (DAB 13F). Note how flat it is on a decent antenna.

So, lesson learned; there are indeed important differences in 'digital' TV antenna design, and it also reminded me not to compromise on the feed cable from the antenna. Use a single run of high quality 75 Ohm cable, with no joins. And forget those rabbits' ears!

Network Analysers

While we are focussed on antennas, let me mention another Vector Network Analyser (VNA) I've discovered.[1] This cool little toy, the AT-1000 by IW3HEV and IW3IJZ, operates from 0.1 to 180 MHz, and communicates (and is powered by) a USB link to a computer. There is software for both Windows and Linux, and apparently the unit will find the frequency of lowest SWR on your antenna automatically. The going price is about US$400.

There is now a Bluetooth version of this unit available in Europe from WIMO[2]. This unit is powered by an internal Li-Ion battery, and with Bluetooth communications, you can hang it up in the air, actually on the antenna - and view the results with no wires attached!

New Digital Modes book

The *Technical Handbook for Radio Monitoring HF*[3], written by Roland Proesch DF3LZ, is an updated 2013 edition, and gives descriptions of some 250 different modes, including most Amateur ones. The book's main focus is signal identification, so doesn't have the technical details of how the modes work, or even where they are best used. It does describe each mode in a general sense, along with spectral displays of most of them. Some modes have oscilloscope shots or spectrograms added to their description, where these would help in identification.

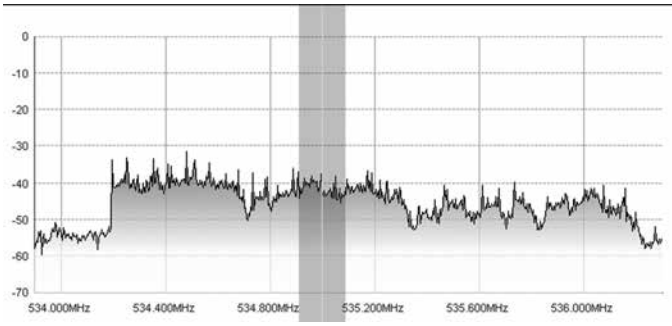


Figure 1. Non-flat DVB-T reception.

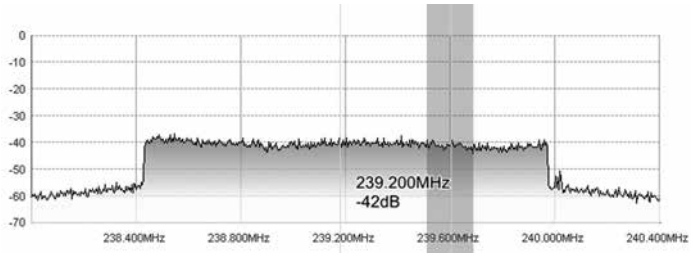


Figure 2. Digital Audio Broadcast reception.

I found the book interesting, and quite comprehensive, and it includes a wealth of information you are very unlikely to need, even if you're a keen military and utilities digital DXer. There is plenty I didn't know anything about. While the book is in English, unfortunately the translation from German is not entirely reliable. I suspect it has been auto-translated. This doesn't detract from the usefulness, but is rather quaint!

Bluetooth

Maybe you've heard about this odd-named communications mode. Yes indeed, it is a digital mode, and operates at 2.4 GHz. BT is intended for secure short-distance communications, typically between intelligent devices and a host computer, things like RFID tag readers, bar-code wands and hands-free mobile phones. Bluetooth will handle both digital data and audio, and was first developed in 1994, so although not widely used until recently, it is a fairly mature technology. Many mobile phones now include BT, typically for use with a hands-free kit or earphone, but often also to broadcast music to a stereo player.

Bluetooth is a frequency-hopping spread-spectrum mode, using a combination of PSK modes to send its packets. BT version 2 operates at 3 Mbits/sec, while version 3 operates at up to 24 Mbits/sec. Multiple devices and links can exist in the same area, and they are typically 'paired' manually before use, so the necessary data goes securely to the right destination. The pairing process is usually straightforward, and the range is typically 10m or so, although it dislikes going through walls. I have no trouble operating two BT links and a 2.4 GHz wireless network around the house at the same time.

I recently mail-ordered some inexpensive BT devices. Perhaps the most useful was a match-box sized BT receiver which I have plugged into my stereo, so I can play music from my laptop or tablet from the comfort of my armchair! The tablet, like many phones, came equipped with a BT transceiver, while I use an inexpensive USB BT adaptor with the laptop, and the adaptor looks like a sound card to the computer. Both computer devices also have WIFI, and I can use either to play music from a large hard drive residing on my network. The BT USB dongle cost only US$2 and the receiver about US$14. I also have a small BT audio transmitter, which I can plug into my HF transceiver, and with the previously mentioned BT receiver connected to headphones,

wander around the house while listening to QSOs on HF.

Android operating system

The pace at which new mobile computing devices are advancing is pretty incredible, and Android is arguably at the cutting edge. Based on Linux, and similarly open source, Android has a strong mobile supplier involvement, and has been tailored specifically for mobile platforms, which have significantly different requirements to a conventional operating system.

You will recall that early home computers were based on even older systems using keyboard input, and printer or screen-listing output (did you ever play Star Wars on an early CP/M machine?). DOS-based PCs were little different. Windows offered simple graphical display and the use of a mouse, and slowly over the last 20 years we've come to accept that as normal. Modern mobile computing is however very different; touch screens are de rigueur, and input is often by touch, gesture or even speech, as much as by keyboard (keyboards are simulated on the touch screen). Gestures such as press, 'long press', 'wipe' or two-finger 'squeeze' or 'stretch' (for zooming) are used extensively. Sounds daunting, but believe me, even an old-timer can learn to use them quickly enough.

Since Android was first released in 2007, it has advanced at an amazing pace, bringing with it closely matched advances in hardware, because the promoters, the Open Handset Alliance, is a consortium consisting of major component, mobile device and internet giants such as Texas Instruments, Qualcomm, Samsung and Google. The latest Android version (4.3), released just last month, is now on my new tablet, and is very impressive. This unit (Asus Nexus 7) was designed specifically for Google to market, and operates all the integrated software seamlessly. It makes my perfectly functional but two-year-old Android 2.21 tablet (circa 2010) seem like a dinosaur. Especially when the new one sports a quad-core processor!

Another SDR transceiver

I recently learned about a new SDR transceiver that will be available soon, the ELAD FDM-DUO[5] I believe from his comments that Alberto I2PHD has been involved in its design. What makes this one interesting is that not only can it operate with a computer (in the same way as the Flex 1500 I reviewed in the last column), but it will also operate stand-alone! As a stand-alone transceiver it will operate CW, USB, LSB and AM. With the computer added you get a host of other modes, including DSB, synchronous AM, wide-band FM (with RDS) and DRM. The transceiver runs 5 W, so similar to the Flex 1500, but looks like a much nicer unit, especially having the stand-alone mode, although I suspect it might be a bit expensive. It also has CAT control. Is this the future direction of SDR transceivers?

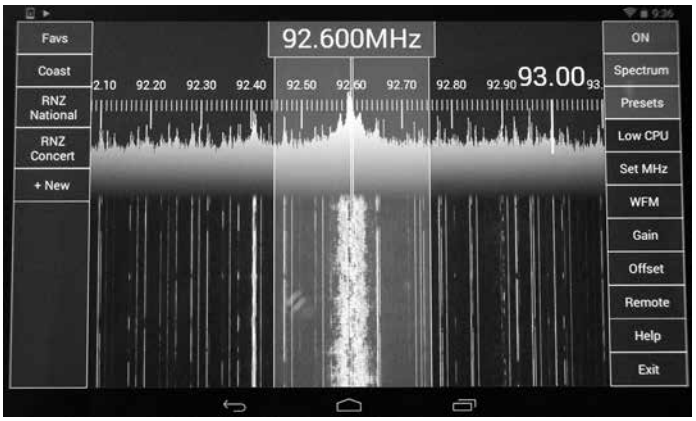


Figure 3. SDR Touch on Wideband FM.

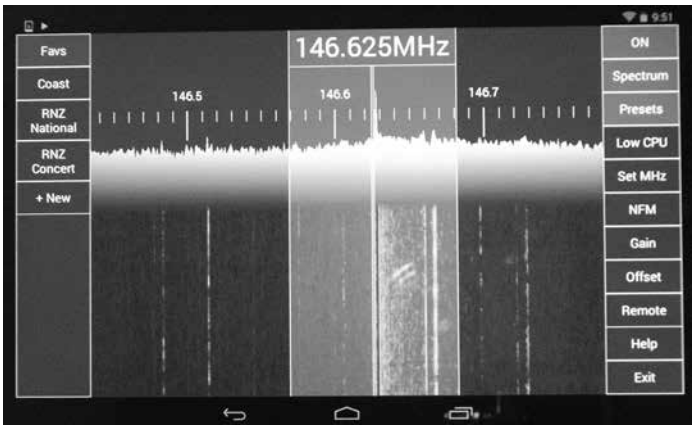


Figure 4. SDR Touch displaying 2 m FM.

RTLSDR on a Tablet

Those of you with a reasonably modern Android tablet or phone should take a look at the TV dongle program SDR Touch[6]. If you don't have a tablet; perhaps now is the time! SDR Touch is a cool program which does much the same as the popular SDR# program, but allows the total portability provided by the tablet. See Figure 3.

All the controls are on the screen, with preset memories on the left and the various controls for mode, gain and so on, on the right. In the centre at the top are the current frequency, the tuning scale and spectrum display, with a waterfall below. You can turn off the waterfall, but not control the speed or height.

While you can tune or change bands using keyboard input after touching the 'Set MHz' button, within a band it is generally just as convenient to whizz around by sliding the scale with your finger. You can also slide the signal under the reception band (highlighted area) by sliding the spectrum or waterfall, change the received bandwidth by sliding the edge of the reception band, and even zoom in by spreading two fingers in typical Android fashion.

Figure 3 shows Wideband FM mode. The receiver displays 1 MHz of band at a time (maximum), is easy to tune, and gives great audio, no stuttering or clicking noises that you might expect from a slow device. The software also operates NFM, AM, USB, LSB, CWU, CWL and DSB. Figure 4 shows SDR Touch zoomed in on the local 2 m repeater in NFM mode, 300 kHz span.

To operate SDR Touch on a tablet you need a recent version of Android, a fairly fast machine, and probably an OTG cable to plug the dongle into since few tablets have USB ports. SDR Touch has a driver that supports OTG, and both my dongles were recognised and worked perfectly. This is a serious application, if a little limited in controls, and it will even stream signals using TCP/IP either to or from a PC so you can listen remotely. The filters could do with improvement, and I haven't found a squelch control yet.

SDR Touch and a dongle on VHF and UHF are a pretty good combination. On HF (using an external up-converter) I didn't find the performance as good as the same dongle with HDSDR on a PC, but then I'm sure the software will improve. The filters and notches in HDSDR take a lot of beating.

630 m DX QSOs

Graham ZL1QM and Nick VK2DX have broken new ground recently, holding QSOs on 475.7 kHz on two successive evenings. Watching the 630 m WSPR signals over recent weeks, it became clear that signals both ways generally improved to better than -14dB S/N late in the evening, giving a window of about an hour when a two way QSO could be attempted. Not many modes will give keyboard-speed QSOs at -14dB S/N, and they chose (on my advice) to use DominoEX4, since it's simple to tune, goes at a respectable 25 wpm, and has the necessary robustness and sensitivity (about -18 dB).

On the first occasion copy was virtually error free, once they found each other. Considering DominoEX has no error correction, and that Graham lives in the urban QRM

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Mode	Type	Protocol	Speed wpm	Sensitivity SNR
DFCW180	Analog (read by eye)	One-way	0.01	-20 (estimate
CASTLE QRSS3	Analog (read by eye)	One-way	1	-15
Opera8 (OP8)	Digital CW	One-way	0.1	-34 (estimate)
WSPR2	Digital MFSK	One-way	0.75	-30
WSPR15	Digital MFSK	One-way	0.1	-38 (estimate)
CMSK8	Digital MSK	QSO	3.75	-21
DominoEX4	Digital MFSK	QSO	25 (!)	-18

SPAM – Society For The Preservation Of Amplitude Modulation

Bill Olsen ZL4AE
<b_olsen@xtra.co.nz>

Greetings all. Another two months have gone by. Where does the time go? I have a very disappointing task to advise this month. Some time ago I suffered a somewhat debilitating "stroke". Medical and other events happening in my life have dictated that I am totally over committed and this has impacted quite severely on my well-being. This column is unfortunately one of the commitments I must divest myself of. To that end I must resign from being scribe for this column, with effect from now. This is probably my last column. There must be capable beings out there with better skills than I have. Please advise the Secretary of 'SPAM', Steve Miller ZL1FS <zl1fs@nzart.org.nz>, or the editor of *Break-In*, of your availability. They will be more than pleased to hear from you!

Gleaned from Martyn's very informative newsletter, a link from George ZL2GM a link for military manuals <http://www.liberated-manuals.com/>.

Why do we do it? Sometimes we are abused, belittled, shocked into reality, told our equipment is outdated and defunct. Ridiculed because we are slightly off frequency because we don't have digital readouts. Other times we are praised for the quality of audio, the clean strong signal, the fact you are running analogue but are still spot on frequency. Your old boat anchor must have taken a lot of work to get it into that condition. It just makes it so worthwhile, that I am not surprised that our cars wheels fall off, the washing machines leak water, and the tumble dryers don't tumble anymore. Who could think of a better way to spend your time? Answer: "It's AM"

Still looking for someone to write an article on the workings of the "AREC Mk1", as per the column last issue. There are still a few around, mostly in enthusiast collections. There is one in the Otago, Branch 30, collection which was the Otago Branch AREC unit. I have had a long exposure to it and have used it extensively. But, sadly, not on the internal workings of it , It was solid state (discrete) and used 'quick heat' , miniature valves in the transmitter final and I think in the audio output stage. Apart from that I do not know a lot about them!

I was reading in a magazine recently about microphones. Fascinating to read that the first known device dates to 600 BC with the invention of masks with specially designed mouth openings that acoustically augmented the voice in Greek amphitheatres. In the 1600's an English physicist made a "telephone" with a taut wire between two cups. In the mid 1800's, Alexander Graham Bell patented the first practical "telephone". Several other inventors worked on "microphones" in the late 1800's, but it's adaption in the 1920's lead to its inclusion in radio technology.

Well That's it for this month. Not a lot of news. People are not sending in any items. There must be any amount of happenings out there but unless the scribe knows about them, they go unreported!

I will continue to read the column with great interest and I wish the next scribe all the best. I would have liked to continue with the task, but it's just not possible.

73's *Bill*

QSL Bureau

by Barry Stewart ZL2RR
<zl2rr@xtra.co.nz>

Greetings to all readers. Your QSL Bureau was closing down for its Annual Leave / 'Sabbatical' (unpaid!) at the time of writing this column; just a few days after the August *Break-In* arrived in the letter box.

A few good-sized parcels of cards have recently arrived e.g. 2100 QSL cards from JA, 720 from HA, 620 from W-land, 608 from DJ, 380 from HL along with several smaller packets from various bureaux resulted in a flurry of outward postings to the ZL-Prefix Sub-bureaux.

Since the report in the last *Break-In*, the ZL1-Prefix QSL Sub-bureau has received a 5 kg parcel of QSL cards, ditto ZL2 whilst the ZL3-Prefix Sub-bureau has received five 700 g envelopes and the ZL4s just the two envelopes.

Ken ZL4HU, recuperating down in Clyde had plenty of time to stare at the stack of unclaimed QSL Cards sitting in his ZL3-Sub-bureau which eventually caused him to work up a head of steam resulting in his posting a missive on several of the local reflectors.

The comments contained within are applicable to many within our fraternity through-out ZL! Rather than re-iterating the major points, I politely ask you, dear reader, to enjoy the piece of prose below and take in the salient points made by the writer, Bernice Peterson, N7MUC.

QSL Bureau Manager's Lament

QSL cards are all over my shack,
Even under the cat, to file or stack.
Your stamps I await, whether postal or green,
For after DXing, you should have foreseen
That cards would arrive through the Bureau Machine.
To some I've sent notes and asked you real nice.
You send no reply but I need your advice.
Your pileup of cards could paper a shack,
But psychic I'm not-I don't have the knack,
And if used for that purpose you won't get them back!
Amateurs foreign are wondering why
They've sent you their card with none in reply.
Are you laid up in bed, or perhaps broke your arm?
Or maybe you've gone to the state funny farm.
I'm worried too! Is there cause for alarm?
Shall I make a long list to send overseas?
"These won't QSL so don't send any, please!"
Working new lands is a challenging game,
And it's fine if you contest, but I feel some shame
If you don't QSL, giving all a bad name.
I'm thankful for those who send postage and labels,
Then patiently wait for their cards as I'm able
To sort them and mail, whether two or ten score.
Those hams are the greatest! Of them I need more!
I'd nominate one for Ambassador.

On behalf of NZART, I thank those members who include a donation with their QSL cards from time to time. This assistance with helping to assist in reducing the Bureau's operating costs is most welcome.

If you have any questions, queries (QSL manager's addresses, etc) or comments please feel free to contact me either via mail (1 Caversham Road, Westmere, Wanganui 4501 or PO Box 857, Wanganui Mail Centre 4540), or Email: <ZL2RR@xtra.co.nz>

73 *Barry ZL2RR*

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the noise rejection capability of the mode. Both stations used FLDIGI and ran about 100 W. For reasons that we have yet to fathom, not many VK stations have made it across the pond on 630 m recently, even on WSPR. The latest to be copied here on WSPR are VK2DX, VK2XAX and VK4QC.

Final finals

I was recently asked to compare some modes intended for very weak signal use on LF/MF. Some are digital modes, some analogue: some are one-way 'beacon' modes, some are QSO modes, which makes direct comparison difficult. I thought you might benefit from the following table:

References

[1] <http://www.w4rt.com/Misc/miniVNA.htm>
[2] <http://www.wimo.com/cgi-bin/verteiler.pl?url=instrumentation_e.html>
[3] Published by Books on Demand GmbH, ISBN 9783732241422
[4] <www.qsl.net/zl1bpu>
[5] <http://ecom.eladit.com/WebRoot/ce_it/Shops/990298944/MediaGallery/FDM-DUO_Leaflet_1_ING_LO.pdf>
[6] <http://sdr.martinmarinov.info/index.php>

Longer Wavelengths

Con Wassilieff ZL2AFP
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First ZL-VK digital mode QSO on 630 m

On 21 August ZL1QM had his first ever QSO on 630m, with VK2DX, around midnight. This is also the first ever two-way contact on this band between New Zealand and Australia, covering a distance of 2160 km. The QSO was with the digital mode DominoEx4. Murray ZL1BPU has been copied in VK in the past, using the digital mode CMSK8, but this was a one-way only affair. It did prove that a two-way contact was possible, as has just been demonstrated.

Graham's rig is an exciter using the Weaver method of generating SSB with a mosfet PA delivering about 100 W to a wire about 33 m long spanning a 9 m tall pole and a 16 m tree.

First ZL-VK CW QSO on 630 m

The 630 m band seems to be on a roll, as only a couple of weeks later ZL1ZLD had a good old fashioned Morse code QSO with VK4QC. I heard the ZL1ZLD side of the QSO at 11pm on 5 September but my noise floor in the 630 m band is quite high due to sidebands from the inter-modulation product at 477 kHz arising from two AM broadcast stations at Titahi Bay, not far from Wellington, so I heard nothing from VK4QC.

Had I used my tuned loop that night I might have had a chance of hearing VK4QC as the direction of Titahi Bay is at right angles to Australia and I am able to null out the interference. I managed to improve my WSPR (Weak Signal Propagation Reporter) reception of VK2DX by at least 15 dB using the loop instead of the omni-directional active e-field whip.

ZL1ZLD was received at 539 by VK4QC, but VK4QC was only 339 at ZL1ZLD, due to heavy QRN.

Murray ZL1BPU reports that he received several new VK WSPR stations recently. This and the two QSO's seem to point to good propagation conditions in recent weeks.

Belgium joins 630 m

From 15 August Belgian holders of a HAREC licence are allowed to use 472-479 kHz with 5 W EIRP on a secondary basis.

73 kHz band available in the USA

As of early August 2013 some radio amateurs in the USA have received a transmitting licence covering 68 to 76 kHz with 10 W ERP allowable with few mode or bandwidth restrictions. The 73 kHz band was the original LF band in the UK many years ago before 136 kHz was made available.

More RTL-SDR experiments

There has been much interest in using the various cheap DAB/TV USB dongles based upon the Realtek RTL2832U demodulator for receiving on the HF bands. The tuners in these dongles tune only in the VHF range. Two methods by which this may be accomplished are by using an "up-converter"; or bypassing the VHF tuner altogether and feeding the signal directly to the input of the demodulator chip and using the "direct sampling" mode available in at least two popular software defined radio receiving programs (SDR# and HDSDR).

Up-converter

A popular up-converter is the "Ham-It-Up" converter from NooElec [1]. I purchased one from their web site (about US$43) and found it worked exactly as advertised. The latest version of the upconverter uses a 125 MHz crystal oscillator to move the lower frequencies to up above the FM broadcast band to reduce the chance of unwanted broadcast signal breakthrough. Low pass filters are included to reduce VHF leakage further. You couldn't build something like this for that price. Both SDR# and HDSDR have an offset that can be applied to allow the shifted frequencies to be read directly, without having to subtract 125 MHz from everything. In this respect it works just like a regular MF/HF receiver.

However, one feature that became immediately apparent is the (relatively) poor frequency stability. The

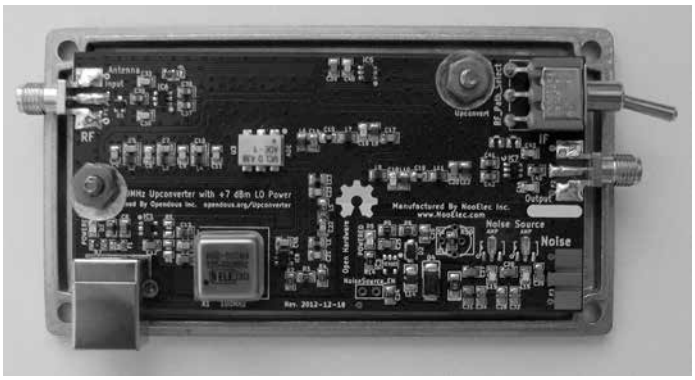

Figure 1: The "Huff and Puff" frequency stabilizer.

specifications for the Ham-It-Up converter state the oscillator has 25 ppm stability. At a frequency of 125 MHz, this is a potential drift of over 3 kHz. Drafts can easily cause a rapid frequency drift of 100 Hz or more so it is essential to ensure the oscillator is in a stable environment. Like Murray ZL1BPU, I enclosed my converter in a diecast box [2]. Figure 1 shows the circuit board attached to the lid of the diecast box. For receiving SSB this stability is adequate, but if the aim is to receive narrow-band signals such as WSPR which take two minutes per transmission and the signal is only 10 Hz wide, the residual drift of a few Hz per minute generally means no decodes of the signal. Even a human-readable mode such as QRSS-3 looks severely distorted by drift of this order of magnitude.

Direct sampling

So, although the up-converter provides a simple means of receiving down to around 500 kHz or so, the stability is not adequate for long term narrow band reception. The second approach is to bypass the tuner altogether and access the demodulator input directly. This requires micro-surgery. Anticipating a lost patient, I bought a few spare dongles. At about US$10 or so depending upon the model, this was a no-brainer. As it turns out I did manage to destroy the four tiny dust-speck SMD capacitors coupling the tuner output to the demodulator inputs, and demolished one circuit board track, but I did successfully solder two fine wires to the I and I-inputs of the demodulator and no harm was done to the demodulator after all. See figure 2 for an example of bad soldering! Just as well I had spare dongles as the tuner in my original one is now kaput. One day I might be tempted to use the dongles for their original purpose as a TV receiver!

Using HDSDR in "direct sampling" mode I found the frequency stability excellent, with short term drift of less than a few Hz per hour down at lower frequencies. The master oscillator in the dongle operates at 28.8 MHz and even a 25 ppm stability (assuming it is that) translates into about 12 Hz at 500 kHz (assuming my sums are correct). Sensitivity is not as good as with the upconverter, but with appropriate front-end transformation, I can get the sensitivity to a point where the

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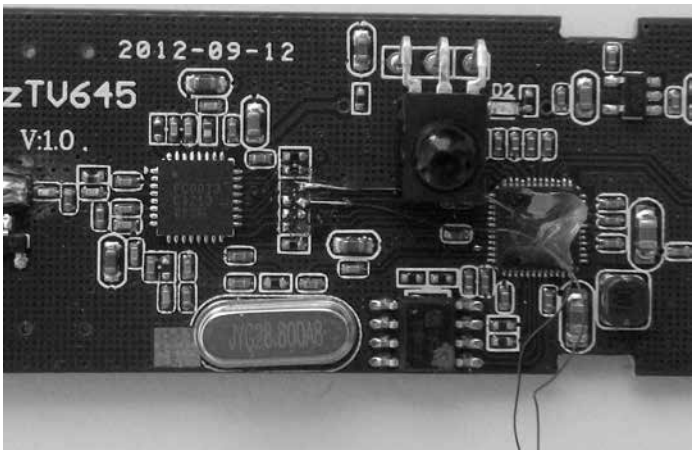


Figure 2: Audio passband of TS-50s with narrow filter selected.

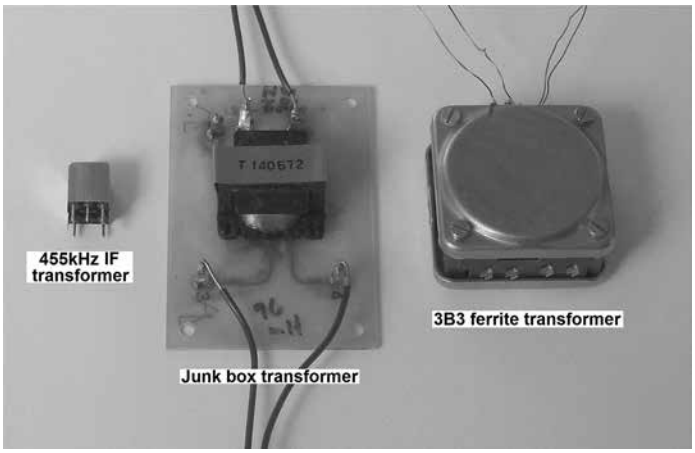


Figure 3: Meter face with mysterious legend at bottom left.

◂ continued from page 23

background noise is dominated by external noise rather than the noise floor of the receiving system.

Now, the "appropriate" transformation was not just a matter of winding a 1:2 balun. If you are interested only in receiving over a limited range (say 630 m only) then a 455 kHz IF transformer, tuned to the receiving frequency, will do the trick. Jaycar still sell a miniature IF/OSC coil pack which fits the bill. Although the IF transformer will give relatively broadband reception, sensitivity drops off at lower and higher frequencies. For true broadband reception, a "proper" broadband transformer is needed. The output impedance of my active antenna is around 50 ohms or so and the input impedance of the demodulator is at least several kilohms (this information is not available from the manufacturer as far as I can tell, but my rough measurements indicate 10 k or so). So a high step-up ratio of about 14 is required. The small IF transformer I used has a turns ratio of 1:10 so this may explain why it gives the best result.

I also managed good results with a transformer that had a turns ratio of 1:3, but the primary and secondary inductances were 96 mH and 782 mH respectively. I can tune this to a broad resonance at 470 kHz with a 5000 pF capacitor across the primary. This also eliminated the severe inter-modulation that results from overloading by AM broadcast stations (especially 2YA at 567 kHz, located in Titahi). The LC resonance frequency should be only 7 kHz, so exactly what is happening here is a mystery.

The design of wideband transformers is a complicated business as there are many factors that need to be considered such as core linearity, inter-turns capacitance, leakage inductance etc.). An ADSL modem transformer is probably a good choice, as these are available in up to 1:4 turns ratio, with possibly cascading of two or more transformers to achieve the optimum transformation ratio.

I have successfully used three junk box transformers for wide band reception, with varying (but excellent) results. Measurements of the primary and secondary inductance, and secondary DC resistance, were made in an attempt to gain a better understanding of what might be going on. Figure 3 shows the three transformers tested.

The 3B3 ferrite transformer with the 1:400 turns ratio has remarkable sensitivity down at VLF (20 kHz) but slightly less sensitivity in the 630 m band (by perhaps 5 dB) compared with the tuned IF transformer. The DC resistance of the 3B3 ferrite transformer is quite low, indicating thick wire and/or high core permeability. The tuned IF transformer gives the best sensitivity and signal-to-noise ratio in the 630 m band. As we are scratching for every last decibel for weak signal reception, this is quite important. Even small audio transformers with iron laminations yielded good sensitivity as long as the turns ratio was high. At this point I gave up trying to understand what was going on and just got on with some serious receiving.

A comparison of the direct sampling reception with the upconverter and tuner showed that the direct sampling configuration was easily 10 dB better (sensitivity, signal-to-noise, inter-modulation performance) than

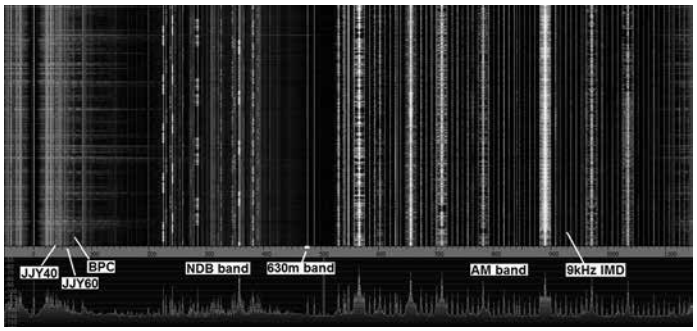


Figure 4: Frame captured from space shuttle video.

with the upconverter/tuner combination. This was in stark contrast to my expectations. The direct sampling method also out-performs my ICOM 746PRO at lower frequencies.

To show just how good reception is with the direct sampling set up, figure 4 presents the HDSDR spectrum from DC up to over 1.1 MHz, taken at night-time. The VLF band is prominent, JJY40, JJY60 and BPC at 68.5 kHz are visible, followed by the NDB band, and then the AM broadcast band. The 2YA signal is over 80 dB above the noise floor. Not bad for an 8-bit demodulator!

Of interest is the presence of inter-modulation signals separated by 9 kHz in the AM broadcast band (all broadcast stations are separated by multiples of 9 kHz). These 9 kHz signals are not due to inter-modulation in my active antenna, rather they appear to be created "naturally", as I found when I connected a plain wire to the transformer input. The ratio of intermod level to broadcast level remains almost constant, indicating the 9 kHz IMD is not caused by overloading of the receiver, but are real external signals (perhaps caused by mixing in rusty fence wire, corroded pipes, etc).

The "direct sampling" mode in the RTL-SDR disables the tuner and transfers the tuning function from the tuner to the demodulator. Tuning appears to be accomplished by IF shift. In figure 4 zero Hz is actually the RTL2832 demodulator local oscillator frequency, adjusted so that the scale reads 0Hz. The "negative" frequencies are just visible to the left as a mirror image of the spectrum on the right. You can quite happily tune the entire HF spectrum in direct sampling mode.

Some tests done on ferrite cored output transformers by ZL2CA

Bob ZL2CA has been investigating transformers for use at LF/MF. He reports:

"As part of an ongoing search for surplus ferrite cores that may be useful for amateur LF/MF transmitter use, a number of emergency lighting inverter PCBs that had failed in service were obtained at scrap value. While several power semiconductors had visible signs of being "smoked" the ferrite cored transformers looked to be undamaged. It seems the original design was to provide high frequency drive to fluorescent lights, with push-pull MOSFETs powered from a large capacity battery supply. The switching frequency is unknown but was likely in the 30 to 100 kHz region (as used by compact fluorescent lamps, the "high frequency" gives good fluorescent efficiency). Tests by Bob ZL2CA on extracted E cores (but with no identifying markings) found the ferrite material to have low loss at 500 kHz, so it is an interesting type of "power ferrite". A 500 kHz power test by ZL2CA with a prewound transformer as a substitute in the output of a nominal 100 W 600 m transmitter found it delivered power to the dummy load and loss was minimal. Con ZL2AFP also tried a prewound transformer and similarly found it to perform well for 500 kHz transmission, and thinks one core could handle as much as 300 W. The following describes measurements on each of two types of prewound emergency lighting transformer as well as results of the same type of core rewound with bifilar primary.

A prewound core designed for switching to be powered by a 12 V battery supply had windings removed to check turns and layers. The "12 V primary" had 4+4 turns of copper tape (insulated by a plastic coating) and the "secondary" had 13+13 turns, all with layer winding, 13 turns on the inside, then 4+4 turns as middle windings and 13 turns on the outside of the bobbin. The 13 turns

were paired wires, presumable for less copper loss and in a form that fitted the bobbin better compared to single wire. Impedance was measured at the 4+4 turn primary for a 51 Ohm load across the 13+13 turn secondary. If the transformer action was a perfect low frequency model the expected load looking into the primary would be some 4.8 Ohms resistive. Table 1 gives actual impedance values:

Table 1 Tests on a prewound "12 V" transformer

Frequency (kHz)	Impedance (Ohms)
400	4.5 + *j*1.7
500	4.5 + *j*1.8
600	4.6 + *j*2.0
1000	4.6 + *j*2.9
2000	4.7 + *j*5.2

Next a prewound core designed for switching to be powered by a 24 V battery supply had windings removed to check turns and layers. The "24 V primary" had 8+8 turns and the secondary had 12+12 turns. The primary was wound with paired wire and as well pairs from adjacent layers were connected in parallel so the 8+8 turn primary effectively had 4 parallel wires, which is one way to reduce copper loss but fit turns neatly on the bobbin. The 12+12 turn secondary also used paired wires, one winding inside and the other on the outside. Impedance was measured at the 8+8 turn primary for a 51 Ohm load across the 12+12 turn secondary. If the transformer action was a perfect low frequency model the expected load looking into the primary would be some 22.7 Ohms resistive. Table 2 gives actual impedance values:

Table 2 Tests on a prewound "24 V" transformer

Frequency (kHz)	Impedance (Ohms
400	22.5 + *j*2.7
500	22.6 + *j*2.8
600	22.6 + *j*3.0
1000	22.7 + *j*4.1
2000	23.0 + *j*7.3

Finally a pair of the same type of cores, with no air gap, was wound with a 15+15 turn bifilar (transmission line) primary, as the inside winding on a bobbin, and the secondary wound as the next layer and evenly spread across the bobbin. Impedance was measured at the 15+15 turn primary for a 51 Ohm load across the 15 turn secondary. If the transformer action was a perfect low frequency model the expected load looking into the primary would be some 204 Ohms resistive. Table 3 gives actual impedance values:

Table 3 Tests on a bifilar wound primary using the same type of core

Frequency (kHz)	Impedance (Ohms
400	215 – j6.6
500	213 + j0.2
600	213 + j 1.5
1000	213 + j4.5
2000	215 + j7.8

Comments on test results are:

These emergency lighting transformers are directly useable for 500 kHz transmitter use, running off supplies around 12 to 24 V, accepting that there is moderate leakage inductance (giving some series reactance).

Even though moderate leakage inductance is inevitable for layer windings, the transformation of the resistive component still tends to follow "turns squared" relationship

Leakage reactance could be "neutralised" within the relatively narrow 620 kHz band by using selected series capacitance with the secondary.

A bifilar primary greatly reduces leakage inductance and is the recommended method for winding an output transformer if starting from scratch, and of course there is scope to adjust the number of secondary turns or have taps to experiment with loading.

Not listed in the above results, a test with bifilar secondary did not show significant further reduction in leakage inductance (but no tests were done for other than a one layer winding, bifilar may be best for multi layers).

In hindsight initial testing of transformers for inductance and open circuit secondary was only partly useful, as broadband output transformers are meant to be properly loaded to deliver useful power and thus operate with very low loaded Q. With bifilar (transmission line) windings the core is less involved with transfer of energy from primary to secondary than in a "conventional" transformer relying on magnetic coupling via the core."

The ZL1ZLD mighty signal

On the subject of my ballpark calculation of ZL1ZLD antenna/earth performance in the last Longer Wavelengths column, Steve Fogerty ZL2ASF writes:

"Of interest in July/August was your comparison of sky wave propagation to ZL1ZLD and ground wave to ZL2T. It appears that you have shown just that the ground wave path has poorly conductive ground between you and ZL2T and nothing else apart from that ZLZLD works well relative to other transmitters. The propagation modes are quite different, good ground wave propagation depends on highly conductive ground between the two stations. In a perfect world the ground would be an infinite sheet of silver plated copper of zero Ohmic loss. Both stations TX and RX would have their ground connected directly to it. Sky wave needs an efficient antenna and radial system to function properly plus a good reflective surface in close proximity (sea water). Musick Point has both; textbook engineering.

Martin Barringer in NAB Engineering handbook describes ground waves:

"These waves are characterised by the fact that they are guided along the earth's surface, similar to a transmission line. The field is attenuated in this propagation mode by losses in the ground.Therefore the composition of the soil have a direct bearing on the amount of attenuation the wave will experience..."

On a similar topic, some years ago I was travelling down the lower Buller Gorge road whilst trying to listen to the Westport (Cape Foulwind) AM transmitter. I drove onto a bridge which crosses a tributary of the Buller River and just 10 metres away from the main river. The signal increased by about 20 dB or more. I also switched to the distant Nelson and Wellington transmitters but no increase in signal strength at all was found. This was midday in late summer. I thought about this and figured the signals travelled down the river and turned the corner at the mouth of the river and then by sea to the south about 10 km to the Cape Foulwind transmitter. Later that day I returned in darkness, all signals were improved at that bridge as would be expected via ionosphere of the distant transmitters.

I relayed the news to a colleague who has a good understanding of HF propagation the next day. There was great mirth and disbelief until he heard the effect for himself some months later. Later I delved into propagation books of the early propagation researchers work (Kenneth Bullington from memory) who described the path of sea or fresh water as waveguide, so yes the river is waveguide. Strange but true!"

630 m liaison net and daylight saving

By the time this issue of *Break-In* is mailed out the 630 m net will be operating on alternate Thursdays, being the 1st, 3rd and, where it occurs, a 5th Thursday of the month. Once daylight savings begins (29 September), propagation worsens due to one hour less "night" conditions and this also affects the liaison net on 3166 kHz. Should 80m prove unfavourable for communication, it is proposed to move to 7166 kHz, as 40 m propagation is generally better under these conditions. The liaison net will commence at 8.30 pm as usual, with 630 m transmissions from 8.40 pm onwards, with five minutes allocated to each participant.

References

[1] http://www.nooelec.com/store/ham-it-up-v1-0-rf-upconverter-for-software-defined-radio.html#.Uiwsy38cRiw

[2] Digital Modes, *Break-In*, March/April 2013.

Stop Press: NZART Conference 2014

I am pleased to be able to advise that our 2014 Annual General Meeting and Conference will be held in Blenheim over Queens birthday Weekend (31 May to 2 June) at the St Mary's School.

The Conference is bring hosted by Marlborough Amateur Radio Club, Branch 22. Come prepared for a great time and an awesome alternative programme!

Vaughan Henderson ZL1TGC
President NZART

VHF Scene

Simon Watt-Wyness ZL1SWW
<zl1sww@nzart.org.nz>

As I start writing this, I note the weather is slowly improving and the days are getting longer. Wasn't that long ago where it was 5.30 and I was coming home from work in the dark, at least now it is still daylight. The next promising thing will be daylight savings which will be upon us again and more time to play around in the daylight. Bring it on!

As spring / summer approaches, we all hope to see a rise in activity from all corners. It's always a bit quiet over winter and hence the 'scene can sometimes be a little thin. Having said that, I must thank my faithful contributors for their input and enabling me to pass on a snapshot of what is happening around the country.

6 metres

The recent activity looked a little thin on 6 judging by the activity on the logger. There have been good spottings from VK and JA to Mark ZL2WHO's beacon along with ZL TV carriers being heard in JA.

Alan VK4WR/ZL1RQ and Graeme VK4FI will be heading to Niue December 7 for 10 days. Prime band of interest will be 6 m. Timing of this trip is to take advantage of summer time E's. Hoping to work many ZL, VK and Pacific stations. QSL to VK4FI.

Bob ZL1RS reports that it's been a bit thin on the 6 m DX front over the winter period.

The scribe has been hard at work rebuilding his 6 m beam that had seen about 10 years of being up the tower. Progressively bits were falling off it so it has come down, and is in progress of having a birthday. With the Analogue TV nearing switch off on December for us northerly people, it has given me more incentive to get cracking on this project.

In regard to antenna building, don't forget there are some good programs available to design antennas. Two I use often are the late Chuck Smith WA7RAI with Quick Yagi at <http://bgdocs.org/download/law-7110/7110.doc> and John Drew's VK5DJ Yagi antenna designer at <http://www.vk5dj.com/yagisetup.exe>. With all these low band TV antennas on the roofs of which won't be much use soon, will be a good start to converting to 6 m use. Some modifications to these have seen a quite wide bandwidth antenna at low cost. Often a good tidy up of corroded parts is needed and a suitable balun connected. Some element lengthening may be needed as the case may be.

It was sad to hear the passing of Fred ZL1ADP on Thursday the 8th August. He was a keen VHF person and in particular 6 m. He will be missed by many.

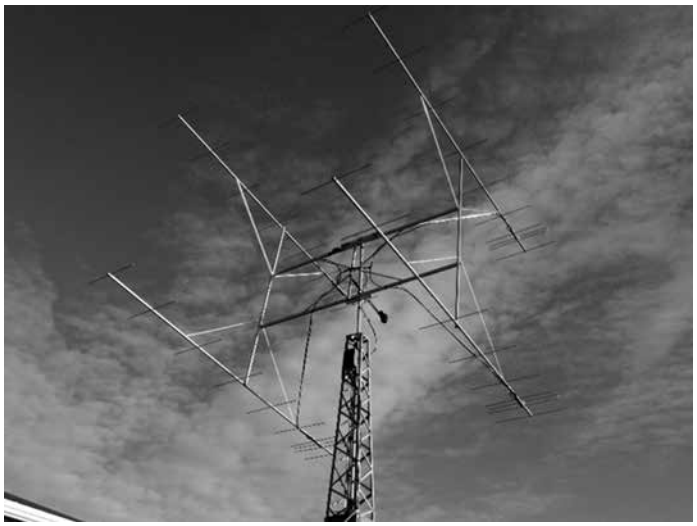
2 metres

There has been the usual flurry of activity with the WSJT modes during the weekends. The scribe finally got around to fixing his interface so could now be operational again. Good contacts had throughout the country on this mode.

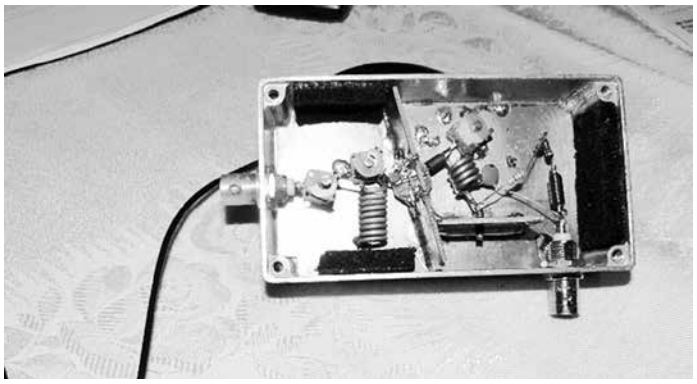
Peter ZL4LV reports that he had a contact with Harry ZL2ADU on the 30th July, a distance of 772 km using JT65 mode. His signal report to Harry was -19 and a direct terrestrial contact, not moon bounce. This distance is surprising as Peter's home QTH is behind a hill known as Swampy Summit about 600 m high. His QTH is at 200 m and not too far away from the hill. He also had a contact with Rod ZL3NW who had a big signal into ZL4LV.

Harry ZL2ADU has been working on a new project of 4 * 9 element Yagis with elevation ability. He started working EME on 25/6/13 using a single 9 el Yagi with no elevation, so limited to contacts at moon set. After 20 odd contacts he decided to upgrade to something better. Until this started he was having a nightly contact on 144.2 with Roger ZL3THQ. If Air NZ had a plane over Nelson at the time, he always had 5X7 reports. Otherwise signals depended on tropo conditions, but he always got through.

He has been using a mast head preamp. The device is a NE334S01 that should give him a noise figure of between 0.2 and 0.1 dB. He cannot measure it, but it works very well.



Harry ZL2ADU's EME Antenna Setup.



Harry ZL2ADU's EME preamp.

Kevin ZL1UJG is back on the air again for Meteor Scatter after having refurbished his 30 year old Yaesu FTV700 transverter. There is still a regular session on Sunday mornings using meteor scatter. The time is 0800 to 0900 local and the frequency used is 144.223. One can probably add with the meteor scatter that the takeoff towards the South from the northern Hamilton QTH is non-existent, with the antenna firing into a big lump of dirt, at the end of the section, but still the meteors get through. He elevates the antenna about 10° and with the angle of the incoming reflections, allows regular contacts as far away as Peter ZL4LV in Dunedin. Kevin also wants to express his thanks to all the efforts of the Meteor Scatter stations in the South Island, his logbook is starting to fill up. One can listen with a SSB VHF transceiver, a soundcard and Joe Taylor's WSJT suite of software (FSK441 on Meteor Scatter). Kevin, like many others is also slowly getting his 6 m station in good condition for when analogue TV switches off.

Bob ZL3TY reports on his EME activities. "In July I had 13 QSOs, August another 11 QSOs. Highlight was working the J45EME DXpedition.

The only other activity is the regular weekend meteor scatter sessions, Saturday mornings to VK and Sundays local ZL activity. The VK sessions start around 8 am on 144.33 MHz using FSK441, ZL goes first period. The local ZL sessions are on 144.23 southern stations first. There is healthy ZL activity, often around 6 or 7 stations on, including ZL1UJG, ZL2MQ, ZL3CU, ZL4LV, ZL3THQ, ZL3TY. Co-ordinate activity on vklogger.com

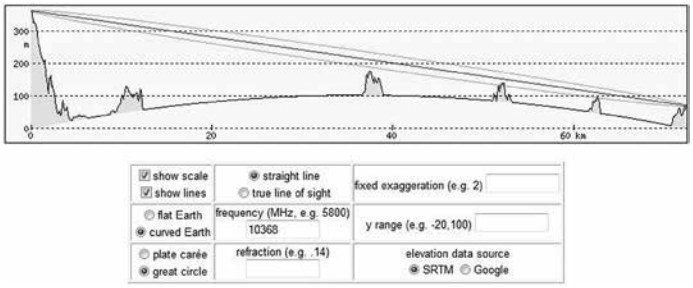
KB5WIA has a good blog with lots of interesting stuff, including notes for smaller stations wanting to try EME". The website is <http://kb5wia.blogspot.co.nz/2013/06/a-check-list-for-optimizing-small-144mhz.html.>

70 cm

Mark's beacon on 432.271 MHz has been operational and it is good to see a few people hearing it from various places.

1296 and above

The Scribe got a phone call from Ross ZL1UGZ in regard to him wanting to test his new 1296 station



A 70 km 10 GHz path profile.

that he has been building up over time. He has about 70 – 80 W out on this band. We had a good contact over 20 or so km; him at Arotaki Visitor Centre (West Auckland) and ZL1SWW at his home QTH operating off the driveway. We initially tried from both our homes but the path was too hard with some large bits of dirt between us. Steve ZL1TPH also joined in later for a good QSO as well. Ross aspires to be on 23 cm EME at some stage.

Dave ZL1AKW has been progressing along with his 3400 MHz transverter. He is building the VK3XDK variant. It will be good to have another person on this band.

Wayne ZL2BKC has been busy developing and building a 3.4 GHz beacon for the Wellington region. With recent advancements in digital modes the plan is to cycle between JT4G and CW during alternate minutes.

The RF exciter boards are based on the ZLPLL board which uses an ADF4351 PLL chip which is capable of directly synthesising any frequency from 32 MHz to 4.4 GHz.

The controller board is based on the Atmel ATMega1284 chip which has ample resources to drive 4 bands simultaneously. It is planned to also operate a CW/JT4/FSK441 beacon on the VHF bands from the same site (potentially 2 m and 6 m) which will give early warning of weak signal openings, and allow people to experiment with some of the emerging digital modes. On-air testing will start in the next few weeks once the final touches have been added to the firmware. Wayne has some more information on his website at <http://www.zl2bkc.com>

Other Items

Bob ZL1RS also wants to draw the attention of Hams who are members of clubs north of the Harbour Bridge to the annual Northland-North Shore Contest to be held from 8 – 9 pm on 21 October 2013. This local area "sprint" style contest includes participation on 2 m as well as 80 m. Last year's contest was a bit of fun and a great way to catch up with people from the local area. The Bay of Islands ARC will be out to maintain its grip on first place and clubs north of the Harbour Bridge can consider the gauntlet laid down. More info at: <http://www.qsl.net/zl1boi/news3.html.

No doubt at some time or other, you may have been planning an SHF QSO to a location for the first time. You ask yourself "Can we get through or not?" There are some good tools for doing a path analysis to get a rough guide to see if the path is feasible enough and if you are going to try, will set some expectations in the least. One piece of good software that the scribe used was Radio works. The SRTM data has now stopped being published and hence short of hosting it yourself, it has become unusable.

Another good tool free to use is on website called "Hey What's That" at <http://www.heywhatsthat.com/profiler-0904.html>; it is a good simple way that we can check paths just by pointing and clicking. Several settings can be set for such things as flat / curved earth etc. The image below shows a typical output where you can turn things on and off such as Fresnel zones etc.

2013 VHF-UHF-SHF Contest Calendar

Microwave Contest. All bands 614 MHz and up. First Saturday in October, and the following day.

Field Day Contest. All bands 50 MHz and up. First Saturday in December, and the following day.

For all contests, the operating periods are 1700 to 2300 on the Saturday, and 0700 to 1300 on the Sunday, NZ local time. The Contest Rules are available at: <www.vhf.org.nz/VHF-UHF-SHF-ContestRules>. All contest logs should be sent, to arrive within two weeks, to: <zl2wa@clear.net.nz>

Summary

Many thanks go to the contributors who help make this column happen with their input; ZL1UJG, ZL1RS, ZL2ADU, ZL2BKC, ZL3TY, ZL4LV, VK4WR, and others. If you have input and pictures for the columns ahead; such as DX activity reports, repeater installation, branch activities, snippets of interest, technical items etc, please send to Simon ZL1SWW at <zl1sww@nzart.org.nz> or *Call Book* addresses. (I also accept large picture files sent via email).

Break-In 50 Years Ago

Craig Crawford ZL3TLB

***Break-In* September 1963.**
AWA 1913-1963

In 1913 two companies, Marconi's and Telefunken, amalgamated their business interests in Australia, and so it was that Amalgamated Wireless Australasia Limited came into being.

One year after the company was formed World war 1 broke out. Enemy surface raiders began their destructive attacks on allied shipping in the Pacific and Indian Oceans. The desperate urgency for radio and transmitting equipment for ships was met by the growing factory. A special school was established up by the company to train men to install and maintain transmitting and receiving equipment on land and at sea.

In a few short years following the first war a breakthrough in international communications was made when AWA in Australia received the first direct wireless message from Marconi's in Great Britain, thus bridging a record distance of 10 000 miles. Spurred by these encouraging achievements, AWA engineers turned their attention to a dramatic new development – the transmission of speech and music.

In 1919 a small group of people were present in an AWA research laboratory when engineers demonstrated the magic of the first Radiola receiver. A year later AWA inaugurated regular radio broadcasts from 3ME Melbourne, and thereafter, a popular demand for broadcast programmes burst across the land like a forest fire. To satisfy the needs of the nation AWA manufactured both the broadcast receivers and the transmitting equipment.

In 1936 the first high-power broadcast station in the Southern Hemisphere was built by AWA and installed in New Zealand at Titahi Bay. This remarkable equipment served several generations of New Zealanders as 2YA Wellington. A quarter of a century later the transmitter was still in service as 2YC and affectionately known to NZBS engineers as "old faithful".

As in the first war, so in the second, AWA offered all the company's productive power and experience to the fighting services. Radar and other complicated electronic devices were manufactured in the extensive 20 acre plant in Sydney.

As soon as the war clouds lifted AWA focussed on peaceful pursuits and a large number of high-power transmitting stations were manufactured. Since 1948 well over 70 communication and broadcast transmitters have been supplied to New Zealand, amounting to a half million watts of radiated power.

In 1932 AWA scientists were absorbed in the principles of television and, in a joint experiment with Marconi's, a picture transmitted in England and was received by AWA in Australia. In 1950 AWA demonstrated 625 line television in New Zealand for the first time and in 1954 televised the Royal Tour in Australia to hospitals and institutions.

1958 marked the installation of New Zealand's first official television service at Channel 2 Auckland. Now all four television stations in New Zealand use transmitters and cameras supplied by AWA.

Magazine Survey

Compiled by Grahame Fraser ZL3SJ
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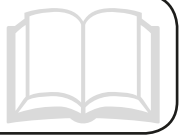

Amateur Radio (WIA)

June 2013

p.6 Receive 7 MHz on a 27 MHz CB radio – make your old AM set useful again (converter using transistor crystal oscillators as local and b.f.o.)
p.14 A low distortion two tone oscillator
p.18 Review: the Ten Tec R4020 QRP CW transceiver
p.23 Will the REAL PL-259 connector please stand up (two different threads)
p.25 Foundation Corner 23 -Baofeng UV-5R review

July 2013

p.22 The best AR receivers
p.6 Teaching and learning the foundation licence.
p.19 Elecraft KX1 – an outstanding rig for field operations.
p.24 A 4:1 Guanella balun using readily available parts

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p.10 The OzQRP MST400 SSB QRP transceiver kit; user review
p.17 Rapid deployment ground systems for short vertical antennas
p.25 InnovAntennas
p.30 A very strange circuit

CQ

May 2013

p.34 How to Begin Using LEDs
p.48 A Look at D-STAR and the "Mini Industry"of products It has Inspired
p.70 Computerised Antennas and Antennas You Can Tune With a Sledge Hammer
p.95 Propagation: A Weak Cycle but Double Peak Possible

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p.34 Field Day on the Highest Frontier (satellite contacts)
p.37 The Great RFI Hunt (including unplugging everything in the house)
p.41 The "Singapore Sling" Antenna Support Launcher (tennis ball catapult)
p.43 A Battery Monitor for 12 V Systems (four colour LEDs)
p.45 Done in One: Build a Hidden Switch (preventing unsupervised operation on Field Day)
p.57 Hands On Radio #125 The Schmitt Trigger
p.59 Remote Station Control with Google Chrome
p.67 Field Day Towers – Doing It Right
p73 Straining to Hear: Why Filters Are Our Friends
p.96 Vintage Radio: The Heathkit HW-30 "Twoer"

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p.34 A Miniature SSTV Camera to PIC Interface
p.37 The Real 2 Meter Q-Pole (for those fooled by the one in the April issue.)
p.39 Use Your Mobile Station as a Base Antenna Platform (park your 4WD close to the shack)
p.44 Product Reviews: Antenna Tuners: MFJ-9982, Palstar AT2K and AT2KD
p.51 Magnetic Loop Antennas
p.57 Sun Noise – A Valuable System Measurement
p.60 Hands On Radio #126 Phasors, Part 1
p.96 The "Murphy Bench" (to fit on top of a washer/dryer pair)

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p.34 There's a Ham Band at 900 MHz ? (antennas and available radios)
p.37 Build this Two Element 30 Meter Beam (6.5 dBi gain Yagi)
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p.43 Product Review: TEN-TEC 539 Argonaut VI HF QRP Transceiver
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p.53 Hands-On Radio #127 Phasors Part Two
p.55 Tuning Troubles (fixing rotary encoders)
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p.65 Ragchewing 101 ("get to know your fellow hams")
p.92 Opening Deconstructed: VK4MA to the Midwest (6m propagation)
p.99 Engaging the Next Generation of Hams

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p.32 Two Handy Mods for Your UPS (external battery and LED to replace buzzer)
p.33 A 21 MHz Four Square Beam Antenna (four quarter wave verticals)
p.41 Done In One: Audio Voltmeter (5 LEDs indicating dB levels)
p.42 Build An Audio Distribution System (for multiple operators and multiple radios)
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p.60 Hands-On Radio #128 Phasors, Part Three
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p.24 Early Transistorised Transmitters
p.26 The International Amateur Radio Union (IARU)(from T&R Bulletin July 1925)
p.30 Technical Topics (reprint of the first of Pat Hawker's (G3VA) articles in RSGB Bulletin, April 1958)
p.32 An Effective Multi-Band Aerial of Simple Construction, by Louis Varney G5RV (from July 1958 and November 1966)
p.34 PSK31: A New Radio-Teletype Mode, by Peter Martinex G3PLX (from December 1998 and January 1999)
p.40 The changing face of radio: from crystal sets to touch screen technology
p.42 A Compact Arrangement of Hertz Aerial by R Pollock G5KU (from T&R Bulletin March 1926)
p.44 Single-Sideband Transmission Applied to Amateur Telephony by N G Hyde G2AIH (from RSGB Bulletin December 1949)
p.46 Field Days: Eighty years since the first RSGB National Field Day
p.54 Model Aerials by F Charman G6CJ (from Proceedings of the RSGB Spring 1949)
p.56 Tuning of Low Power Transmitters using Hertz Antennae by S F Evans 6YV (from T&R Bulletin March 1926)
p.58 The RSGB Archives: How good is your memory (13 unidentified photographs)
p.62 Transatlantic Tests: Crossing the Atlantic with amateur radio
p.66 The Possibilities of Television, both With and Without Wires by A A Campbell Swinton 2KH (lecture to RSGB on 26th March 1924)
p74 A 1939 vintage radio station (at Amberley Industrial Museum, UK)
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p.24 Homebrew: Continuing the 70 cm transverter project
p.30 Data: SDR dongles and sound cards
p.34 Equipment Review: Rigol DS2000 series of digital storage oscilloscopes

DX Downunder

Graeme Hunt ZL1ANH and ZL1T
<graemeh@xtra.co.nz>

Thanks Gary ZL2iFB for producing the August DX Downunder column. There are lots of other ZL DXers who I am sure would improve this column with a contribution, even be guest columnist, and we'd learn a lot more than just reading my input. Email me.

Conditions in July and August have been pretty average, although 80 m at dawn is starting to open to Europe and there are some remarkable long path 20 m signals arriving from places like India and Algeria in our mid afternoon.

XZ1Z has been active from Myanmar, which is encouraging as the regime hasn't been too welcoming to radio amateurs. A major DXpedition to Myanmar is in the offing. One previous operation was never approved by DXCC as the operators were in the country illegally.

Apparently we have reached the peak of underwhelming solar cycle 24 as scientists tell us the poles on the sun are reversing. Apparently the sun has a north and south magnetic pole and these switch over at sunspot peak. No, this is not the April *Break-In*. Another amazing feature of our solar system, and another reason to ponder how it all came about. Visit <www.universetoday.com> for full data.

In October and November there are four contests that present excellent opportunities to work some DX. The Oceania, where we live, has the SSB contest on the 6th October and the CW on the 13th. One of the world's largest contests is the CQ magazines world wide CQWW contest with SSB on the 26th and 27th October and the CW contest on 23rd and 24th November. Just Google for the rules. Particularly in the CQWW events, operators will travel to exotic DX locations so that they are more keenly sort by other contestants. Remember anyone can enter the contests; even if it's only for a few minutes, and you will be most welcome to participate. If you are a contest newbie, listen to a couple of contacts and you'll soon get the idea.

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p.44 EMC: Software Defined Radio for EMC plus RFI from gas boilers
p.52 Design Notes: Accurate power measurements using ingenious 1960s technology
p.72 Start Here: The basics of inductors

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p.30 40 m Sudden " Italian style'

Remote Radio

Check out <http://www.remotehamradio.com/>. You pay a minimum of US$3000 per year plus more for extra minutes to use a super station in the USA or Italy. Included in your subscription is the front end of a K3 that is sent to you, and operates the superstation via the internet. You can listen to them operating on their website.

From ZL3IO

Not much activity on my end due to being busy and house building. 40-17 m are reasonable good into all directions. High bands close soon after sunset and 10/12/15 m was not very active. I had a couple of times a CQ machine on 10 m CW going while working on the house and most of the times something came back (mainly North & Central America). Contests obviously can change the bands. During IOTA contest 10 m opened late for a short time at our Sunday evening enabling me to work about 10 HQ stations from Europe. Conditions during WAE were tough with 15 m best via long path during our local mornings. 40/20 m were great allowing me to run pile ups into Europe with 100 W and simple antennas (vertical 40 m & hexbeam).

73 Holger

ZM90DX is a special event call to commemorate 90 years of real DXing. Period of activity is Oct. 1st, 2103- Oct 31st 2014.

In 1923/1924 a number of ZL DXers around Frank Bell Z4AA established first ever radio contacts from New Zealand to Australia, later into North and South America and finally in Europe with a QSO between G2SZ an 18 year old student from Mill Hill College in London and Z4AA at Shag Valley Station in Otago on Oct 18th,1924. QSL via M0OXO, More info on <www.zm90dx.com>

Amsterdam Is FT5ZM should have good signals into ZL on most bands.

World War 1 and with the banishment of radio amateurs to the supposedly "useless shorter wavelengths" an amazing period of radio exploration took place. Amateurs all over the globe soon learnt that far from being useless, these wavelengths seem to allow communication over long distances. Amateurs in ZL were at the forefront of this activity with the first ZL to VK QSO in April 1923, and then world record distance QSOs between ZL and Argentina in May 1924, ZL and California in September 1924, ZL and Connecticut on the US east coast just weeks later, and the ultimate Z4AA Frank Bell's QSO with Cecil Goyder G2SZ in London on 18 October 1924

To commemorate the 90th anniversary of the record breaking activities of these early pioneers of Amateur Radio, ZM90DX will be on the air between 1 October 2013 and 31 October 2014 on all bands 160 m to 1.2 GHz and beyond and all modes. Activated by the Kiwi DX Group, an informal group of DXers and contest enthusiasts, ZM90DX will be used around New Zealand and a special commemorative QSL card will be available as well as an award program for contacts with ZL during this period.

Not only will ZM90DX be active at expected times and on expected bands, but in the spirit of those early pioneers the ZM90DX operators will also be calling CQ on bands and in directions one may not necessarily expect with the intention of exploring the boundaries of radio propagation.

This will be an unparalleled opportunity for Amateurs the world over to work ZL while celebrating the exploits of those early trail blazers whose work paved the way for radio communications as we know it today. Further details can be found on <www.zm90dx.com> or contact ZL3IO.

Amsterdam Island

Draw a line from southern Australia to the southern tip of South Africa and the tiny speck half way between them is Amsterdam. The good news is there is a DXepdition planned for January and February 2014. It won't be a difficult shot from ZL on most HF bands if you don't factor in the QRM from thousands of keen dxers.

Amsterdam Island was discovered in 1522 by the Spanish explorer Juan Sebastian Elcano and the Dutch were first to land on the island in 1696. The reason why nobody landed until 170 years after it was discovered is evident. There are no beaches or harbours but today there is a small settlement. Somehow it is now a French protectorate. On the same latitude as Tauranga, its average temperature in January is around 18°C.

From the late 1700's onward, an interesting history of the island unfolds with stories of people marooned

continued on page 30

Keen DXer Ian ZL1OGX.

◂ *continued from page 29*

on the island, shipwrecks, political changes, and even attempts at farming which led to the existence of a herd of feral cattle which still occupied the island until about a decade ago. Visit <http://www.amsterdamdx.org/> for more information.

From Amsterdam Island, head south 2000 km and there's Heard Island, another most wanted country. A DXpedition has been postponed till 2015 because the ship originally scheduled was going to cost US$1 000 000 and add another US$500 000 for other logistics. A smaller ship is being sought in an effort to reduce costs.

Tom Christian VR6TC of Pitcairn Island fame died in July. Many of us worked Tom over the years for this rare country.

Ian ZL1OGX

Having been licenced since 1987, just a new comer, I was issued the call GM1XOG in Scotland. I worked mostly on 6 m. Being very close to the magical DXCC with 15 W for a long time out of a Yaesu FT690r plus a small linear and a HB9CV for the antenna. I managed the VUCC *(Maidenhead squares certificate, Ed)* with relative ease after all there was a big lift what with the upcoming solar max. After several years of playing on 50 MHz a few of my friends whom I had gone through the radio exams with,pushed me into doing the Morse assessment, after passing I held on to the GM1XOG and got MM3XOG to go with it.

Coming to ZL land in 2003, I just brought the VHF/UHF handy; all the rest of the kit was due to be packed into the container and shipped off. Once the gear arrived I set about getting a proper ZL call. I applied to the MED with all my documents from the UK and asking for ZL1XOG, only to be told that the 'X' series was not issued, at that time, so they moved the 'x' to the rear and gave me ZL1OGX. Once all sorted I set about getting a G5RV up and digging out the radio from the container stuff, the XYL was a bit miffed that the station was almost the first thing unpacked.

I have to say that operating from ZL has been interesting, you don't quite have 50 – 60 DXCC countries on your door step, band conditions are totally different to what I experienced in GM land, it's been a learning curve. So today I still use the rig I brought over an Icom IC-706Mk2 with its AT-180 and ATU added a Heil mike to it. The antenna has changed to a Diamond CP-6 vertical, the wife was complaining about the number of wires about the section. Currently I'm sitting at 176 worked countries, yes not a lot but not too bad with 100 W and a vertical and having to go to the office. Also I'm playing about with digital modes at the moment, it's fun working EU on 20-30 W.Also in some of my spare time I look after the website of Branch 29 – North Shore, <www.qsl.net/zl1ab> if you want a wee look.

DX biographies are always welcome; email me, Graeme ZL1ANH

Celebration of the first ZL to G land radio contact

On the 18th of October 1924, the first radio communication contact took place between Frank Bell Z4AA, a sheep farmer in Shag Valley, Otago and Cecil Goyder G2SZ, an 18 year old student at Mill Hill School in London. The contact took place between 0615 to 0730 UTC on 80 metres. The Radio Society of Great Britain, in partnership with groups of UK Amateurs in the UK and New Zealand, invites participation in celebration of the 90th anniversary of this event in October 2014 by recreating that original contact between the UK and New Zealand on the 80 m band. For 2013, there will be activity preparing for the celebrations in 2014 and the special call GB2NZ will be active to stimulate the interest in celebrating the event from 5th to 25th October 2013.

It is suggested that those with suitably equipped stations might like to join in the "dry run" tests in October 2013 on 80 m. Others may like to make contacts with New Zealand amateurs on the HF bands.

The RSGB have set up a dedicated website to commemorate this event and you can find this at <http://gb2nz.com/> There you will find predicted propagation between the UK and New Zealand for 18th October 2013. Either side of this date, the propagation is expected to generally follow the same pattern. Contacts on both CW and SSB are encouraged and GB2NZ will be active on both modes, on 80 m when there is propagation but otherwise on other HF bands.

To help celebrate this historic occasion at the New Zealand end the call ZL90DX has been arranged. We intend celebrating not only this historic event next year but also Frank Bell's other major DX events this year, like the first ZL VK contact in 1923, the first ZL LU contact 1924, the first ZL W contact 1924 and finally with something big the ultimate of the first trans-world contact in October 1924. Please feel free to contact Mike Mather ZL2CC <zl2cc@xtra.co.nz> or phone 0211 664830) for further information if you would like to get involved.

Vaughan Henderson, President, NZART (Inc.)

DXpeditions

Amsterdam Is FT5ZM planned for January-February 2014;see above.

Antarctica VK0JJJ, Craig from Mawson Base until January 2014.Active on SSB, digi 160 to 6 m.

Burundi 9U look for HA3JB, now living there. 20 m SSB and PSK31

Djibouti J28NC for the next two years

Gabon TR Sebastien, F4EIH, will be in Gabon for at least three years

Gough Island ZD9KX for one year. ZD9KN heard on the bands recently was a pirate.

Heard Island VK0HI postponed until 2015

Juan Fernandez XR0Z Robinson Crusoe Island. Mario, CE0ZOL, is the airport manager on Juan Fernandez and will be on the island for the next 6 months.

Kenya 5Z4/LA4GHA until December 2014. Also see Somalia below.

Marion Is ZS8C and ZS8Z .Two radio amateurs are in the wintering over team from May 2013 to April 2014.

Mozambique C28DX ,15-22nd October

Myanmar XZ1Z now active mainly on SSB 18 MHz and 14 MHz

Sable Island CY0P, should be active from 30th September.

Somalia 6O0LA and Kenya until December 2014 while LA4GHA is on a work assignment for the UN

Nets

ANZA Daily: DX net at 0515z on 14183 kHz and now also Saturdays 0445z on 21205 kHz. Mondays, Fridays and Saturdays it is followed by the Pacific DX net on the same frequency from 0600z.

Arabian Net: Fridays only 0500z 14250 kHz ;host JY5HX and features exotic Middle East calls.

What's on the air now? <www.dxsummit.fi/DxSpots.aspx>

QSL information: <www.qrz.com>

Acknowledgements: 425 DX News, OPDX Bulletin, NC1L.

Contact me at *Call Book* address, or by email at <graemeh@xtra.co.nz>.

Monitoring Service

Monitoring Service Co-ordinator: John Martin ZL1GWE
<john.martin@nz1.ibm.com>

Greetings to all, including Short Wave Listeners and contributors. Spring here is upon us, and propagation appears to be improving. From an intruder perspective, there has been an increased number of sightings of OTHR, military signals throughout the last few months. We have heard of CODAR (Coastal Ocean Dynamics Applications Radar) which is normally distinguished from other systems by the fact that it measures the height of ocean waves and their variations, and normally send out transmissions between 1-2 Pulses Per Second (PPS) and transmit continuous 24/7 and uses low power. Look below 14 MHz for an example, which normally is always there.

However, we are coming across HFSWR type radar systems, which are High Frequency Surface Wave Radar. They are used to detect low level, fast moving aircraft, helicopters and unmanned air vehicles, plus high flying fast moving aircraft and large and small surface vessels. They are normally erected on coastal areas and capable of long ranges up to 200 nautical miles or more, operating between 3 and 30 MHz You will often hear them as low speed 7 PPS and greater systems, depending the resolution required to resolve the incoming target. They are based on the principle that a ground wave has three components: direct waves, ground-reflected waves and surface waves. As long as the transmitter and receiver are close to the surface and/or the range is sufficiently long, the direct and ground-reflected waves cancel each other out, leaving only the surface wave. They are relatively cheap to deploy and use for surveillance purposes, compared to a HF Sky wave radar system. They normally consist of a number of vertical antenna or loops normally on a coastal plain.

This is best illustrated with a picture (Figure 1):

They are sometimes confused with the CODAR systems, which are normally floating systems deployed in coastal areas, to detect ocean variations including early warning of Tsunamis or similar situations.

In the latest Region One's monthly report, the "V" beacon on 7027.5 has been heard again. It has also been heard on 7122 kHz, as well but in this case it was heard with many "V" signals transmitted at the same time. If you hear this signal from Region 3 please report it. The Iranian OTHR has also been seen frequency hopping across the entire 10 metre band here in Region 3, so even if the band appears to be dead, you can find this wide band HF radar system, with 307 PPS with alternate 850 plus PPS transmissions. It is very distinctive.

There has also been some interesting activity on the 40 m band at approximately 0800z with a noisy OTHR, across the lower and mid ranges dominating the usual night time activity on this band. Once again if any one hears or sees these signals please report them.

The picture in Figure 3 has been annotated with examples of Australian based JORN OTHR and HF Man Pack 8-PSK signals.

Intruder System Observer League Table 2013 (up to end of August 2013

Contributor Name/Call-sign	Number of verified reports
Bob ZL1BAD	599
John ZL1GWE	525
Stephen ZL1TPH	101
Rex ZL4IV	5
Phillip ZL2TZE	5
Bert ZL1VT	3
Gary ZL2iFB	3
Tony ZL1TTG	3
Ken ZL4NR	1
Cliff ZL4AS	1
Others; VR2BG/P	4

Thank you for all contributors. If you have a signal you cannot identify, please provide an audio sample, and we will attempt to recognise it for you. Please report intruders to: <MS@NZART.org.nz> or <MS2@NZART.org.nz> or <IntruderWatch@GoogleGroups.com> or to your favourite DX Cluster. Please include if possible, the frequency, time in GMT or UTC, mode, strength and direction (if available). A real bonus would be an audio sample, long enough for identification purposes and any observations you have. If you have any questions, do not hesitate to contact me directly.

John (ZL1GWE)

Break-In Editor Position Vacancy

Our long serving and much respected Editor of *Break-In*, John Walker ZL3IB, has advised that he will be stepping down from that position next April. While ideally the new Editor will come from the Canterbury area in order to maintain the existing relationships with our typesetter/printer and dispatch people, this is not essential. High speed internet connections should make it relatively easy to send and receive files and maintain the liaison with the magazine production people Interested persons please contact –

Vaughan Henderson (President) ZL1TGC
<zl1tgc@nzart.org.nz>
Telephone (09) 418 1071 for further information.

HFSWR antenna array.

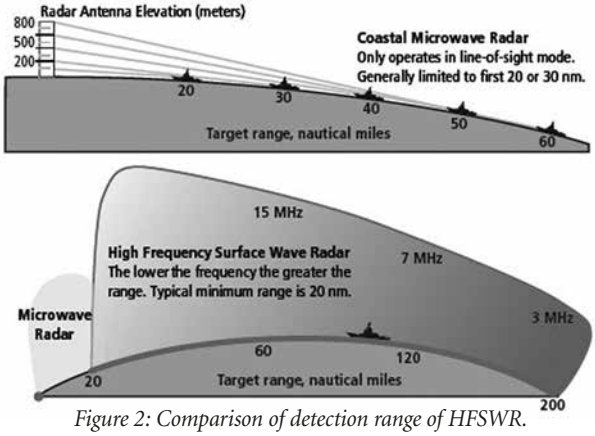


Figure 2: Comparison of detection range of HFSWR.

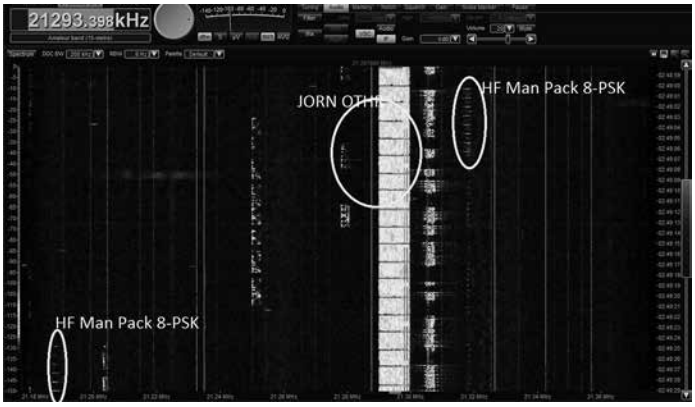


Figure 3: OTHR and HF Man Pack signals.

References

[1] <http://www.flickr.com/photos/57524362@N08/5581796528/>
[2] <http://www.raytheon.com/newsroom/technology_today/2012_i2/persistent_surv.html>

AREC – Amateaur Radio Emergency Communications

Geoff Gillman ZL3QR and Bev Gillman ZL3OV

AREC Mission Statement:
To be the preferred provider of Emergency Communications to New Zealand Emergency Services.

Hi, Everyone. In this issue we have a story of the work needed to operate comms for a car rally. Of interest there is the mention in there of older equipment becoming redundant with the changing of some commercial repeaters to narrow mode. Here in North Canterbury we are about to go through the same process with the forestry company that we work our Fire Comms with. Fortunately our AREC radios can be easily re-configured, but the company and many of it's contractors still own older type radios which will need to be replaced.

Catlins Rally Comms

The Annual Catlins Car Rally is a "big thing" on the rally calendar. The Catlins rally area is from south of Owaka and further north to Balclutha. It has over 160 km of special stages. It has a good following from competitors mainly because of the southerners "can do" attitude and the friendliness of the locals. This year there were 69 competing cars at the start of the day. Numbers were slightly down, but let's put that down to the global financial crisis. There were 13 permanent retirements throughout the day.

My first step of organising the radio comms, is when the Clerk of the Course rings me with a date and an approximate area of rallying. Luckily they stick to the same roads as they have used in previous years. Just change the direction, or the time of the day they use them. Lucky, because I have two favourite sites for the STSP repeaters that we use. We had used 40 metres some years ago for some of the rally course, but now we can use 2 metres for the entire rally.

Paperwork first; I send a letter to the two property owners requesting their permission to site the two STSP repeaters. I then email the two NZART branches who own the STSP repeaters, requesting their use. 146.675 is from Branch 30 in Dunedin and 146.725 belongs to Branch 61 in Alexandra. Both repeaters although quite different in configuration, worked faultlessly. My extreme thanks to both Branches involved.

Historically the rally management team consisting of five Clerks of the Course, Sweeper Car, Safety Car, Chief Medical Officer; all who had a Ham operator sitting beside them for the day, acting as their personal assistant/radio telephonist. I graduated to this lush job after a few years of doing stage start/finish points. We were using Amateur 2 m frequencies, so only an Amateur operator can transmit on them. After spending the most boring day I'd ever spent in radio and being chauffeur driven I might add, I thought there must be a better way.

I kind of regret that suggestion now because of all the extra work that it involves. I suggested to the rally management team to use E band VHF repeaters so the Clerks of the Course can use the R/Ts themselves, freeing up ham operators. The Clutha District Council has four linked E band repeaters which provide excellent coverage for the area. An email to the Clutha District Emergency Management Officer later and we had permission to use their network for rally day. The Clutha District Council repeaters are used for Civil Defence and Rural Fire, so if there was such an event we had to have another repeater channel to use. Local NZART councillor Terry ZL4TAE has an E band repeater which would provide coverage to most of the area, and it would be our back up plan, Thanks Terry. Excellent, now where will I find all the R/T's needed? This wasn't too much of a problem at first. The Eastern Southland Car Club have five Tait 2000 R/Ts and I have a number of Tait 2000's and some Icom R/T's. The Car Club have mag mount aerials and 12 V cigarette lighter adaptors and I begged, stole and borrowed the rest. They found the R/T's were so handy that the number they require this year had increased to fifteen.

The CDC repeaters have changed over the last couple of years to narrow band which rendered the Car Club wide band Tait's of no further use. I had to look further afield to find 15 narrow band R/Ts but managed to achieve this "with a little help from my friends". Thanks Allister.

I had an assortment of Tait and Icom R/Ts to be programmed a day or so before the rally and unprogramme them the day after the rally to return them to their rightful owners.

Amongst this I also had to assign stage start and finish positions to the 19 Amateurs who volunteered to help. The Ham operator has to be at the start or finish position at road closure time (or near enough to it). Each car leaves at minute intervals so this would take 70-90 minutes. We then wait for the sweeper vehicle to crawl through the stage. After that, the ham can be assigned to another position, as long as he has enough time to get there by the road closed time of the next stage. I managed to do this with 4 operators, which saved me a bit of man power. This planning is traditionally left to the last minute, as Murphy's law dictates there will be a last minute change when one of the volunteers is called away elsewhere for the day. This year I did leave it to the very last minute. I over looked emailing the info out 6 days before and emailed it the night before the rally. Every email I sent, I had kept attaching the maps, the volunteer positions, and times to be there, but forgot the frequencies we would be using, which were the same as last year. Well I knew that, but not everyone had been doing it year after year.

I also had help setting up the STSP repeaters. Daniel ZL4DE picked up the 6725 repeater from Alexandra and dropped it off at my business premises. Martin ZL4JH and Terry ZL4TAE had an early start on rally day to set up the 6675 repeater early that morning. They also had the opportunity to retrieve their repeater off the hill that same afternoon as the rally shifted off that repeater onto another 2m repeater.

Friday afternoon, the day before Rally day, has always been a bit of a mad panic to set up the rigs at Rally HQ. I felt I had enough on my plate so I left this up to the capable members of Branch 35. This consisted of two 2 m rigs on the STSP frequencies and the E band base set for rally management. They erected a temporary pole with four new antenna a week or so before. It is a blessing just to be able to plug a coax lead into the back of a rig, instead of hanging temporary antennas around the building the day before the Rally.

The second STSP repeater was flown up by helicopter. Again this is always left to the last day (or minute) before the rally. The Car Club had suggested that I install it by land, but it would take too many man hours. It is possible by 4 wheel motorbike but my time is too precious to waste a day to do that. The rally area is about one and a half hours drive from my home QTH. So I would have to load a 4 wheeler motorbike on a trailer, repeater in the back seat of my vehicle, battery (huge) aerial and poles as well as a fold up solar panel. Then I would have to drive one and a half hours to Owaka, unload everything onto the four-wheeler and probably make two trips up to the repeater site. Not happening! The fold-up 80 watt solar panel is my latest purchase. The helicopter operator doesn't always get the repeater off in a timely manner after the Rally. Last year the battery was completely flat by the time it was retrieved off the hill. I think the battery lost a cell and I had borrowed it off another Ham. I thought I needed to keep a charge in the battery and to not lose a friend, so I connected a solar panel to keep it charging. This meant I could site the STSP repeater on the hill, days before the Rally. The Helicopter pilot rang me the Wednesday before the rally to make the trip, but my work interfered with my hobby. The result, like other years, was left until the afternoon before the rally.

I tested all the Icom and Tait R/Ts two days before the rally. This I could not do from home as the repeaters we were to use are in a neighbouring county. I headed north to our field day site and tested all the Tait and Icom R/Ts by "kerchunking" and blowing into the mike. They all tested fine. Pat on the back. What I did not do was test them in different configurations. I tested them all transmitting to a Tait R/T. All sounded good. I should have tested them with an Icom R/T as a receiver as my programmer had the CTCSS tones on transmit and receive instead of just the transmit. This error did not show up until rally day and it's a

bit late then as no-one had a laptop and the programme to check and re-programme. My bad luck.

Apart from that major hiccup the comms went "sweet as" for the Ham operators. The rally used the new "rallysafe" method of tracking and the Hams were to be there as a back-up to that system. As it turned out the Hams were a back-up to the management team, but that was what it was like years ago, before I started to get too clever. There is always next year to get it right!

I wish to thank all my "Ham" helpers on the day. Also thanks to those who helped me before the day by collecting and gathering and giving freely of their time to help set things up. I did try to thank you all in person but sometimes it just was not possible on the day.

Lindsay Eunson ZL4LC/ZK4EB
Eastern Southland AREC

Activity Briefs

A selection from July/ August

2/7/2013. Marton Branch 23. SAR Training. Wanganui Police Station. Conduct Radio and message training for Wanganui SAR Group volunteers and Police. Well received, good feedback and discussion.

3/7/2013. Northland Branch 28. SAR. Tangihua Road, West of Whangarei. 3x students from Auckland, lost there way in the Tangihua Ranges. Missing party located and escorted out of bush.

4/7/2013. Manawatu Branch 20. SAR. Fairbrother Rd. Missing tramper. Found safe and well.

6/7/2013. Manawatu Branch 20. Rural Fire. Esdale Rd. Relay situation of fire to Fire Comms from ZL2AJ at fire. Report that unit 7371,671, 7675, Pongaroa. Spread contained ,working with multiple high pressure.

7/7/2013. New Plymouth Branch 27. SAR. Makahu, Eastern Taranaki. Personal Locator Beacon activated by farmer. With the assistance of the Taranaki Rescue Helicopter, 3 teams were deployed in rugged country, 1 male was located uninjured and walked out.

7/7/2013. Marton Branch 23. SAR. Ruahine Ranges. PLB beacon set off by trampers about 1400 hr Sunday. Manawatu SAR initiated SAR. Forward SAR Base established at Apiti township. 2 field teams entered search area. Comms on DOC 10 and HF carried. Br. 23 AREC asked to monitor 5680 for possible relay purposes. Search stood down 2000 hr Sunday evening, resumed at 0700 hr Monday morning. Relay required during Monday morning, number of messages relayed to team with MP until Helo extraction about 1200 hr, closed down 1300 hr. Successful operation, MP located by DF on 121.5 locator beacon, MP of 5 and search team extracted by winch to IRQ.

7/7/2013. Manawatu Branch 20. SAR. Apiti. Missing party of 5 found safe and well but cold.

8/7/2013. Christchurch Branch 05. SAR. Hawdon Shelter, Arthurs Pass. Op Crowther; Search for missing person after vehicle found by a member of public in the vicinity of shelter. Communications carried out using DOC repeater, SAR Simplex and Police radio channels, with IMT in Christchurch and Ops staging point at Hawdon Shelter. Search operations conducted (unsuccessfully) over three days and then stood down.

12/7/2013. Otago Branch 30. SAR. Mt Cargill. Search for a 35 year old woman who became lost while walking a track between the top of Mt Cargill and Sullivan's Dam. Search Teams were deployed to look for the missing woman and she was located 7 hr after the initial page.

17/7/2013. Manawatu Branch 20. SAR Training. Manawaroa Street, Palmerston North. Search techniques, introduction to thermal imaging (flir). Comms with teams while tasking.

27/7/2013. Wairarapa Branch 46. SAR. Bute Road, Tinui, Wairarapa. Recover body of 64 year old after he had heart a attack while out hunting on quad bike. Due to terrain-body bought out from bush by helicopter to road end as well as Police personnel.

27/7/2013. Manawatu Branch 20. SAR Training. Paneiri Park, Palmerston North. Training teams around park and checking gps locations. Sartrack Programme and use of IPSTAR equipment. Good results. 4 teams completed tasks.

27/7/2013. East Southland Branch 08. Sports & Training. Catlins area. The Catlins Coast Car Rally. 19 Radio Amateurs actively provided radio communications for the Eastern Southland car Clubs annual Catlins Coast Car Rally. 70 competitors started the day trying to complete 161 special stage km through 8 stages and 80 touring km. Communications were provided by two STSP repeaters and the use of the Clutha District Council VHF network.

27/7/2013. Balclutha Branch 35. Sports & Training. Catlins South Otago. Catlins Car Rally 4 Radio Amateurs actively provided communications for the Eastern Southland Car Club's annual Catlins Coast Car Rally.

1/8/2013. Southland Branch 37. SAR Training. Seaward Bush, Invercargill. Night SAREX. AREC provided communications for LandSAR. 10 LandSAR members present consisting of 3 teams and 1 missing party. ESB Repeater used on ESB57, and Simplex with missing party on ESX07. Clear night with no problems, Finished on time with missing party being located.

3/8/2013. Marton Branch 23. SAR Training. Palmerston North Police Station. Manawatu annual SAREX. Helped run SARTrack software in parallel with SAREX paperwork. Establish WiFi network with 3 laptops running SARTrack. Mapping (NZTOPO 50) with graphical display of teams locations and recording of comms traffic in/out. Very good demonstration and experience using SARTrack. Police SAR members think it's a good bit of software and look forward to it becoming more used in SAR.

3/8/2013. Marton Branch 23. SAR. Waitotara Valley. 2x Missing Hunters, failed to return home the evening before, car located where they entered area, next morning had not returned to car, search mounted. MP found 0830 hr fit and well after night out.

3/8/2013. Manawatu Branch 20. SAR Training. Kahuterawa. 2 day event with over night stay in hills. 7 teams, 4 lost persons. 2 rpts + 1 link rpt. Found lost parties and good test for every one. Comms good.

5/8/2013. Southland Branch 37. SAR. South Invercargill. Search for missing 7 year old boy. The boy went missing around 1800 hr tonight after being sent to the shop by his mother and did not return. AREC tasked to go into Police Station to assist. After arriving at Police Station at 2025 hr the boy was located in the car park at the local swimming pool by a Police Patrol. Stood Down at 2031 hr.

6/8/2013. Marlborough Branch 22. SAR Training. Marlborough EOC. Radio training night searching for excellent radio procedure by all teams.

10/8/2013. Manawatu Branch 20. SAR Training. Palmerston North. Testing HF radio. Sked with Wellington SAR group. Test by ZL2SGA. poor conditions.

24/8/2013. North Canterbury Branch 68. Rural Fire Training. Ashley Forest Village. Forest Fire Training including working with Helicopter and Monsoon Bucket. In conjunction with the fire training scenario of forest fire threatening the village, there was also a Civil Defence training event to evacuate the village. AREC role was as ICP, Fireground comms and checking all vehicles associated with the fire, on and off the fireground. Four local Rural Fire Teams were involved in this exercise.

Conclusion

Thanks to those who have contributed to this issue. Material for the next one to please be in our hands by 3rd November 2013. Photos, if included. preferably on a separate CD (with captions) mailed directly to us. E-mail pix may be acceptable but will be at the Editor's discretion and must not be embedded in the text. Contact details: <zl3qr@nzart.org.nz> or <zl3ov@nzart.org.nz>or post to 6 Boyd Street, Rangiora 7400, or phone (03) 313 7137. (N/B. Articles to please be in doc, rtf or txt format. Publisher or pdf we can not use. Thanks.)

Reminder

The next Section Leaders Nets should be 21 October and 18 November, 3900 kHz USB at 2030 hr NZDT unless notified otherwise.

Until next issue, 73,

Geoff ZL3QR & Bev ZL3OV

Old Timers' Club

Stephen Hayman ZL1TPH
<zl1tph@nzart.org.nz>

From the Desk of the "Grand Old Man"

From The Grand Old Man's pen;. Greetings, Firstly to those who have posted donations to assist OTC funds, I sincerely thank you. To those who would still like to give a small donation it is not too late to post an envelope and a cheque to our Secretary.

It is very sad to see so many members becoming Silent Keys, there are four listed in this *Break-In* and three of those have been within the last two weeks. A one minute's air time silence has been observed during our Monday evening SSB net in respect of these members.

I recently attended the funeral of Brain Nolan Jones, member No, 1279 and it was indeed an honour to be invited to speak at his service on behalf of OTC.

Just a note to anyone chasing Awards; The Old Timers Club has an award; to qualify, 10 members need to be worked and applications are to be sent to our Secretary, Barry Stewart ZL2RR. Feel free to join our net on Monday evening and announce that you are seeking points for the Award and I am positive members will work you after the net. It should be noted that stations worked during the net do not count as points towards the Award.

Finally, if anyone knows of an OTC member who is in poor health or would appreciate some cheer from the Grand Old Man please advise me and I will make contact with that member either in person or by phone or a greeting card.

Until next time this is the Grand Old Man wishing you all good health and many DX

73, *Ivan Horn ZL2ATU,*
Grand Old Man OTC (ZL)

Old Timers' Club-OTC (ZL)

- To recognise service to Amateur Radio;
- To revive and maintain interests and good fellowship among the older members in the common cause;
- To offer advice and encouragement to newer Amateurs;
- The Club is affiliated to the New Zealand Association of Radio Transmitters (Inc.)

Grand Old Man
Ivan Horn ZL2ATU
PO Box 7250 Wanganui.
E-Mail <loobie@kol.co.nz>

Secretary/ Treasurer
Barry Stewart ZL2RR
1 Caversham Road, Westmere, Wanganui 4501.
E-mail <ZL2RR@xtra.co.nz>,
Phone: 06 345 4152

Monday Evening SSB Net
2030 hr (local time) each Monday on 3.870 MHz LSB.

Sunday morning AM Net
Sunday morning at 10.30 am on 3.850 MHz.

SSB Net Controllers
Don Dalrymple ZL3SZ
Stuart Watchman ZL2TW
Pete Moore ZL2AUB
Ivan Horn ZL2ATU
John Poulsen ZL2TCA
Joe Morrison ZL2JM

AM Net Controller
Doug Alexander ZL2AWF

District Representatives
ZL1: Stephen Miller ZL1FS
ZL2: Stuart Watchman ZL2TW
ZL3: Don Dalrymple ZL3SZ
ZL4: Peter Anderson ZL1LR

New Membership

Full membership is available to any holder of a ZL call-sign who has held an amateur licence for the last 25 years or more and is still an active amateur. In addition, the Old Timers Club (ZL) has a provision in its constitution – (4 (c) – to recognise the older amateur with Associate Membership, subject to the following requirements:

Associate Membership; Amateurs of 10 years standing, are of the age of 60 years or over, shall be admitted to the Club as Associate Members without voting rights and be issued with the appropriate certificate.

A one-off membership fee of Ten Dollars is required to be included with any application.

Silent Keys

#453 ZL4KJ Colin Robertson, licenced in 1948.
#596 ZL1ADP Fred Medland licenced in 1954.
#1146 ZL2ABB Stafford Campbell licenced in 1951.
#1279 ZL2AFW Brian Nolan Jones licenced in 1956.

Our sympathy goes to their family and friends.

Certificates sent out

50 year Certificate
#936 ZL1ACM Colin McKenzie

Trevor King ZL2AKW

Amateur radio has been major determiner for the last 66 years of my life. The interest began in 1947, with the Signals Section of the PNBHS Cadet Corps where we were taught Morse code and got to go "on the air". My personal best DX was from the water tower at Linton Camp to the Control Tower at Ohakea Air Base, where we were told to get off the military frequency we were using!

These were the days of War Surplus equipment. I bought a Wireless Set 208, brand new, for two pounds and the late John Dixon then ZL2RQ adjusted the padder capacitor in the receiver section so that a bit more of the 80 m band could be heard. I then discovered you needed a licence to transmit on 80 m, so I sat and passed the Theory and Regulations papers and went down to Wellington where I failed the morse test. It was very intimidating for a 14 year old small boy.

Graham Fraser ZL3SJ, then ZL2AAO, a whole year ahead of me, and he sent me six weeks of "on the air" CW. I subsequently reported to the Palmerston North Radio Inspector's Office, was sat down and given a "practice run", which was pronounced a "pass". I still have a somewhat water-stained Amateur Operator's Certificate of Proficiency in Radio-Telegraphy dated 3 May 1948, and at that time, at 14 years old, I was the youngest ham in New Zealand. You had to be 14 years old or older, in those days, to hold a license.

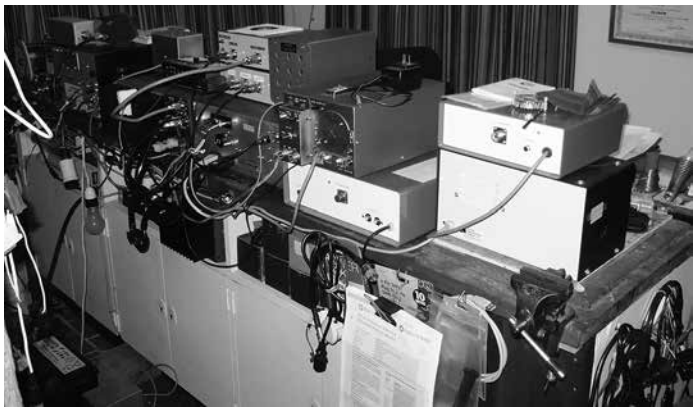
On the strength of this I got an after school job at the late Howard Rowlands radio shop in Cuba Street, Palmerston North. I built a higher powered transmitter using a 2A3 triode Hartley oscillator and within the minimum allowable period obtained a "High Frequency Permit". The late Dan Wilkinson ZL2AB took me for the on air frequency measurements and the 15 wpm Morse test.

The world was now before me, I saved up for a ZC1 which I built an outboard converter for 20 m reception and a parallel 807s amplifier which I could double the frequency to 20 m and get about 20 W. American Forces with signallers were still occupying part of Germany and they were only too pleased to give me a contact. Likewise I worked the Loran operators on Kamchatka Island using the ZC1 on "Phone"; not bad considering the antenna was held up with a length of 4x2.

I had had enough of poverty, so left school after getting the University Entrance qualifications, and did a part season at the Longburn Freezing Works while I waited for someone to be dismissed from the Technical Staff at 2ZA so that I could take up a position as a Technical Trainee at the princely rate of £220 a year.

I made a killing repairing radios for the workers and was brought back on overtime to print and stitch the stocking net bags for the lamb carcasses; I earned enough at Longburn to buy my first motor bike. My ham radio credentials had enabled me to get the 2ZA job ahead of 12 other applicants. Fancy getting paid to have so much fun. I obtained a First Class Certificate in Radio Technology within my first three months; something that was unheard of in those days. I remained a Technician in Broadcasting for six years, coming to Wellington in 1952 to start Engineering Intermediate. At Victoria I discovered a new world of clubs, tramping, debating, jazz (I was President for a year), and drama. Drama became a bit of a distraction partly because I discovered girls.

Broadcasting found out I had nearly completed an Arts Degree, the upshot was a parting of the ways and a promotion to the Electrical Section of the then Department of Industries and Commerce. My subsequent career took me along many paths; becoming ZL3MW at Dobson, whilst running the resident Office for the Commissioner for the West Coast. Back to Wellington hoping for a two letter call, only to be moved down the alphabet to ZL2AKW, and a job as Senior Investigating Officer for the Electricity Distribution Commission with a new qualification, Registered



Trevor's Home-Made and Commercial equipment as seen from the rear.

Trevor ZL2AKW JRC NRD-515 Receiver and the NSD-515 exciter.

Engineering Associate (Electrical), for which I still pay an annual registration fee. I was told, it seemed, I was the only one at that time who also held a Degree in English Literature.

After a second retirement I had more time for Amateur Radio and was elected to Council. In 1991 I stood for and won a contested Election to become President of NZART. They were turbulent times and eventually I packed it in. Fortunately I had chosen Jim Meachen ZL2BHF as Vice-President. Jim was a brilliant leader who subsequently served several terms as President.

Two photographs of my current work place show a combination of home-made and commercial equipment. The main units are the JRC NRD-515 Receiver, a magnificent unit with mechanical filters for CW and SSB, and the NSD-515 exciter, only two of which came to New Zealand. These $8000 in 1983 museum pieces drive a 400 W amplifier, if needed, and feed an half-size G5RV antenna hung between recycled hard wood power poles.

73, *ZL2AKW OTC363*
<tc.koenig@xtra.co.nz>

Monday evening on air OTC net

The ZL6OTC "On Air" net details are 2030 hr (local time) each Monday evening on 3.870 MHz LSB and all are welcome to check-in and say hello.

Acknowledgements

Many thanks go to the contributors who help make this column happen with their input: ZL2AKW, ZL2ATU, ZL2RR and many others.

Summary

The OTC column in *Break-In* is a forum for members to publish a letter, or an article. OTC readers, along with association members, will all enjoy reading and hearing about other radio amateurs experiences, both past and current.

Contributions can be technical, an account of first involvement with early amateur radio, nostalgia, along with vintage radio which all provides an invaluable source of information on the history of their hobby.

The "Old Timers' Club" was essentially a social organisation, and that is still current today.

Articles relating to all aspects of OTC, are most welcome, and to be addressed to: Stephen Hayman ZL1TPH; 68 Kath Hopper Drive, Orewa, 0931 or via email to <zl1tph@nzart.org.nz> We also accept large picture files sent via email and will transcribe hand written letters to text.

73, *Stephen ZL1TPH*

New Members

Name	*City/Town*	*Branch*	*Call-sign*
G H Williams	Whangarei	28	ZL1BBW
P Bycroft	Auckland	86	ZL1AGG
P W Goldstraw	Tauranga	53	ZL1PLG
R L Hunt	RD 1 Huntly	17	ZL1RH
P C Blackmoore	Ranui	3	ZL1KAT
I M G Hill	Waikanae	69	ZL2GKB
C D J Ridgway	Te Mata	13	ZL2PX
G R Denyer	Mt Albert Auckland	2	ZL1GR
A Cranna-Powell	Puhoi	2	ZL1UJD
R Brash	Wanaka	61	ZL4WNK
B Cathcart	Upper Hutt	63	ZL2CHV
B Cruickshank	Stokes Valley	63	ZL4BB
J R N Thornton	Hamilton	63	ZL1JRT
Corey Neal	Auckland	29	ZL1SUZ
Ghamashan Bhattarai	Auckland	29	ZL1NPL
Khooshbu Shakya	Mt Wellington Auckland	29	ZL1KTM
Christopher Mackie	Auckland	29	ZL4UBZ
Richard de Boyett	Auckland	29	ZL1RDB
John Allen	Marton	23	ZL3JA
Bryan Daley	Wellington	42	ZL2ULF

Information about sales of Amateur transmitters

The advent of TradeMe® has seen a remarkable growth in the sales of amateur radio transmitters by a variety of traders some of who are Amateur Radio Operators.

Radio Spectrum Management actively monitors online trading to identify potential risks to the radio spectrum. As part of that we utilise various methods to ascertain compliance. This may be as simple as asking a question on an auction through to removal, investigation and the issue of an infringement offence notice or prosecution.

Some members of the Amateur fraternity have questioned RSM's approach and requirements around the sale of this equipment. In New Zealand the sale of radio transmitters is regulated through the Radiocommunications Act 1989 and Radiocommunications Regulations 2001. Effectively this requires that all transmitters meet a recognised standard and have the appropriate compliance markings for New Zealand. The one exception to this requirement is the sale of Amateur transmitters. These transmitters must still meet a prescribed standard (refer to clause 5.9 of the Amateur GURL requiring unwanted emissions to comply with ETS 300 684) but the Ministry has not required compliance documentation or markings, providing they are only sold to Amateur Radio Operators.

If you are considering selling any Amateur transmitter the obligation exists with you to ensure it is only sold to an Amateur Radio Operator. Any listing must include wording such as suggested below:

"This equipment can only be sold to and used by an Amateur Radio Operator; proof of such a qualification will be required".

For those people actively involved in trading Amateur transmitters, a Licence to Supply Radio Transmitter is also required. These licences are free and can be obtained by completing the application form Radio 3. <http://www.rsm.govt.nz/cms/pdf-library/resource-library/forms/radio_3.pdf>

If you require any further information please contact RSM via the freephone 0508776463 or the web site <www.rsm.govt.nz/cms>

WARO – nz womens amateur radio operators

with Topsy ZL2LS and Ngaire ZL2UJT
<waro@nzart.org.nz>

Hi all from the South Island

Well the weather hasn't been to kind to us; down here it has been so very cold and wet. We have had our fire going non-stop for quite some time now and I can tell you that we have needed to have it going. I haven't been doing a lot since the last issue as I have been in hospital having a back revision operation done. I was so terrified before I went in as I knew how painful and debilitating the first lot of surgery was, but I have been so surprised this time. Out of hospital after two days and no pain relief required since then, not like last time ten days in hospital and flat on my back for 3 of them. How things have changed over the last 17 years. I will be back to part time doing light duties on the 26 August then full time on the 23 September. It is good that I have some craft things to do but I am still bored, and itching to get back to work.

Hi From the North Island

What an amazing spring we have had here, almost like summer. Here in Taranaki our water tank was the lowest we have ever experienced this time of the year.

We held our Taranaki Award between the 10th-15th August and it was amazing to hear call-signs on the air that I havn't heard in years. It certainly stirred up our Taranaki Hams to get on the air and give out points. It was great to see Hams from out of Taranaki doing the Award also, and I hope you enjoyed the experience. We even managed to get 3 VKs through with an award. We will probably make a few changes next year so that we are not so late in the evening. I organised a lunch for the North and South Taranaki Branches to get together and meet face to face after the award. We don't get this opportunity often, so it was great to catch up.

ALARA Contest

Unfortunately this year it was almost impossible to work the contest. It was very difficult trying to hear most VK's and very disappointing for us here in New Zealand as I know many of you were looking forward to doing this.

Remember; when; August/ September 1966

A letter from Joan Johnson in Leicester England was sent to WARO wanting a YL pen friend in New Zealand, after she had attended a meeting where both Don ZL3RW and Gareth ZL3VP from Christchurch were guest speakers. She was hoping to pass her examination in September. Does anyone know if she passed this ?

Both North and South Island nets are working well and in August there were twelve YL stations on frequency and Peggy ZL2KJ was up portable from Christchurch and also another newcomer Molly ZL2ARU. Zelda ZL3AAB joined the net portable from the Greymouth Maternity Home where she had just given birth to her son. Comment was made "that's something the OM couldn't do !!"

Claire ZL1BDZ wrote a small article about three YL's that attended classes back in the early 60's; they were Norma ZL1AMP, Win ZL1BBN and Claire ZL1BDZ.

Norma was the first to get her licence in 1963, Win followed in 1964 and she proceeded to construct a kit-set DX60 Transmitter which was set up in her lounge with a SX111 Receiver. Claire was the last to sit her examination in 1966 and shares operating an Apache transmitter and a Mohawk Receiver with her OM, Dick ZL1AHW, from their farming business home. None of the three ladies are operating on HF as yet but are looking forward to it in the future.

Claire stated that they are grateful for the support and encouragement that they have received from club members and are hoping that more YL's will make the effort to join the Amateur ranks. Well I think we did and we are still getting that support today which is really great to see.

So to all you OM's and fellow club members all around the country, from all the WARO members we thank you again .

Hamilton Junk sale. Left to right: Margaret ZL1MB, Sharon ZL1TJU, Ngaire ZL1KN, Marlene ZL1MYL, Lynnette ZL1LL and Maxine ZL1FW.

YL Activity Week

WARO is inviting all YL's to join us in a week of Amateur Radio fun. This is not a contest, this is a chance for WARO members and YL's from around New Zealand to get together on Amateur radio and help promote Women in Amateur Radio.

However we will be asking contacts to be logged as we will give the person with the most YL contacts a certificate at the end of this week.

- Dates:Sunday 24th Nov to Sunday 1 December 2013.
- Frequencies: 80 m 3695.
- 20 m.
- National System.
- 2 m Repeaters.
- Time: 8 pm to 9 pm every night (2000 to 2100 hr).

We encourage all WARO members to participate and would like all other YL's to come up on air and have a contact with other ladies.

Amateur radio is fun, so why not come and join us, and have a contact and conversation with some amazing women in and around New Zealand.

WARO members at the Hamilton equipment sale

On 10 August a group of WARO members met together for morning tea and a chat. We then moved across to the Icom stand to meet up with our newest WARO member, Sharon Dawson ZL1TJU for our photo. Sharon sat and passed her radio examination during conference at Masterton at Queens Birthday weekend and attended the WARO AGM.

Bev ZL1OS

At the recent AGM of the NZ Women Amateur Radio Operators held in Masterton, it was unanimously agreed that Bev Osborne ZL1OS be presented with this award for outstanding service to our organisation.

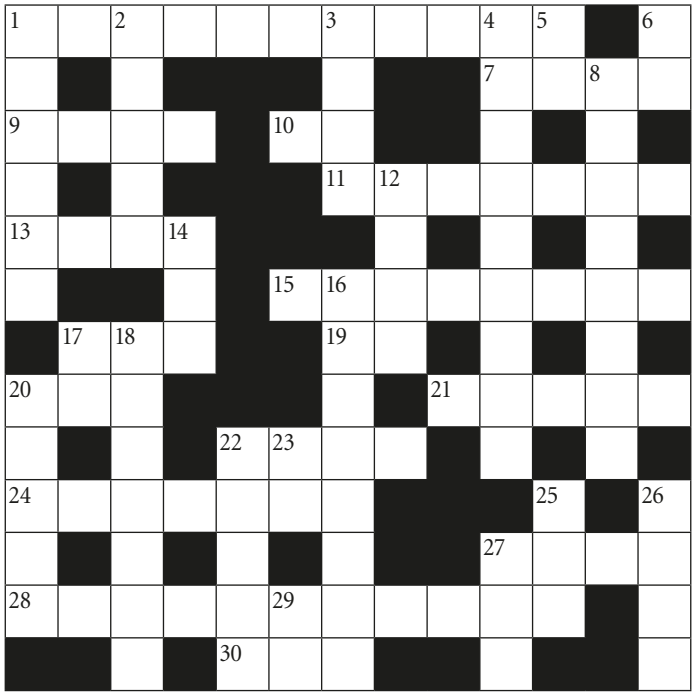
Plaque presented to Bev ZL1OS for her contribution to WARO over the year.

Bev passed her Amateur Radio License in 1992, following a lot of encouragement from her OM Graeme. From then until now she has served WARO with distinction and enthusiasm in everything that she has undertaken. She has served on the Committee, as Secretary, Vice President then took her experience into serving as President in 2002 and 2003. From then until now she has served as our Contest Manager, one of our monthly net controllers, and done an outstanding task as our *Bulletin* Editor, the latter being a task she continues to undertake.

As this has not kept her busy enough, she was one of 5 YL's responsible for the organising and running of the very successful International gathering in Hamilton for YL2000, perhaps doing more than most because of her closer proximity than others to the event. She with others hosted over 190 YL's and their

ZL Crossword No.24

Compiled by Graeme Hunt ZL1ANH



Across:

1 and 11. NiMH (6, 5 and 7)
7. Used to raise or push a liquid. (4)
9. Printer's unit of measurement (4)
10. Type of current at your wall outlets– abbrev (2)
11. See 1 across (7)
13. On your rotator 90° (4)
15. Where the most expensive drinks are (3,5)
17. The death of Cleopatra (3)
19. South of Canada (2)
20 and 20 down. Current Minister of Communications (3.5)
21. Nautical speeds (5)
22. Petty officer on a merchant ship – variant spelling (4)
24. Room temperature or constant background noise (7)
27. Requests (4)
28. Radio's ability to separate desired frequency from those adjacent (11)
30. One leap by the HF signal (3)

Down:

1. Cook wrote of where "On each side of the bluff head is a low narrow sand or stone beach, between these beaches and the mainland is a pretty large lake of salt water I suppose" (6)
2. Initials for the selective tone system used on some repeaters (5)
3. Aeronautical speed measure relating to speed of sound (4)
4. Catch – as in the baddy (9)
5. An Argentine toilet maybe – prefix (2)
6. _ _ amp (2)
8. Add data or speech to a carrier (8)
12. Golfer's putting woes (4)
14. _ _ _ band, 160m (3)
16. Surpass other performers (8)
17. Type of modulation – often used around 300 m (2)
18. Used in every electronic circuit (7)
20. see 20 across (5)
22. Where you fix your radio (5)
23. One of the flip-flop choices (2)
25. Q code, change frequency (3)
26. Small piece of land surrounded by water – maybe with a Dxpedition (4)
27. Place between the rig and aerial-initials (3)
29. Indicates the destination (2)

(*Answers on p40)*

partners from 16 different countries who attended this occasion.

Bev undertook to set up the WARO website which became one of the first YL websites in the World; a site that still runs to-day.

Over the years, she and Graeme attended YL get togethers, junk sales, Branch meetings and activities, and took part providing communications for sporting events in and around the Kawerau district.

Since Graeme's passing, Bev has continued to carry out the activities that she has committed to, and although health, and help to keep equipment going has frustrated her, she has continued to work for the betterment of our hobby and service.

And so to Bev ZL1OS, in appreciation for outstanding service to NZ WARO, we have much pleasure in awarding this plaque and certificate. Congratulations from us all. New Zealand Women Radio Operators.

Continue to enjoy our hobby of radio. Cheers from us both.

Topsy ZL2LS
and Ngaire ZL2UJT

FMTAG – Frequency Management and Technical Advisory Group

Secretary: Doug Ingham ZL2TAR
<fmtag@nzart.org.nz>

A reminder that FMTAG has only one email address

Please send all emails, on FMTAG matters, via the FMTAG email reflector, rather than to individual email addresses, to ensure that all members of FMTAG receive a copy of the email in a timely manner: <fmtag@nzart.org.nz>

Call Book repeater, beacon and link station lists

Our thanks to all Branches that provided their information, and for helping make the next *Call Book* the most accurate yet.

The following Branches missed the publication cut-off date:

20 Manawatu
37 Southland
56 Christchurch West
62 Reefton-Buller

Proposals

The following applications are published for the information of, and inviting comments from, NZART members.

Branch 18 Hutt Valley has applied for a HF Access station at Birch Street, located at TOPO50 BQ32 610359. The transmit and receive carrier frequencies will be: 3.675 MHz LSB, 3.677 MHz LSB, 3.850 MHz AM, 7.075 MHz LSB, 7.083 MHz LSB, 7.175 MHz LSB, 14.200 MHz USB and 14.225 MHz USB. In addition, 3.900 MHz USB will be for AREC use only. An engineering evaluation, in accordance with RSM document PIB38, confirms that there will be no interference to other stations.

Branch 27 New Plymouth has applied to relocate its 720 repeater to Mangorei Road, located at TOPO50 BH29 912603. An engineering evaluation, in accordance with RSM document PIB38, confirms that the repeater can remain on the existing channel: repeater transmit on 147.200 MHz, and receive on 147.800 MHz, and that there will be no interference to other stations.

Branch 74 Wellington VHF has applied for a 70-centimetre digital repeater at Colonial Knob, located at TOPO50 BP31 516426. The repeater will transmit on 439.250 MHz and receive on 434.250 MHz. The modulation modes will be: ETSI ETS 102 361 DMR and EIA P25 Phase 1. An engineering evaluation, in accordance with RSM document PIB38, confirms that there will be no interference to other stations.

Comments and applications

Please send your comments and suggestions on the above, and on any other FMTAG matters, by e-mail to: <fmtag@nzart.org.nz>

Applications for repeaters, beacons, digipeaters, point-to-point links, and so on, should be made on the latest version of FMTAG Form 10. The latest versions of FMTAG Form 10, and the explanatory Form 10A, are available on the NZART website: <http://www.nzart.org.nz/fmtag/index.html>

Completed forms should be sent by e-mail to <fmtag@nzart.org.nz>

Contests

Contest Manager: Frank Hunt ZL2BR
<2bfrank@orcon.net.nz>

Oceania DX Contest

Our very own big international contest deserves all the support we can give it. Dates and times are:

Phone: 08:00 UTC Saturday 5 October to 08:00 UTC Sunday 6 October 2013

CW: 08:00 UTC Saturday 12 October to 08:00 UTC Sunday 13 October 2013 Results of the 2012 contest and rules for the 2013 contest can be found at: <www.oceaniadxcontest.com/>

Memorial Contest 2013

The participation level this year was similar to recent years, except that CW only stations were down in numbers. Log accuracy standards are slowly getting better, but a number of stations got docked a few points (which didn't affect the section placings), for some simple errors, mainly concerning call-signs. ie. a VKxxx call-sign becomes a ZLxxx call-sign and working stations no one else worked, including a number of call-signs that are not currently allocated to anyone at all! Most of the errors should have been spotted by a proof read of logs before sending them off.

All that aside, as log standards are getting better, maybe we should think about scoring declarations (ie. the contest summary sheet) replacing the need to actually submit logs. But in cases where the top scores are very close, the right would be reserved to ask those affected to submit logs when called for. Around the world there are a small number of minor contests/activity sessions where this happens.

Anyway my special congrats go to Phil ZL1PB for a very solid top Mixed Phone & CW score, Graeme ZL2APV who not only managed to make the most CW contacts but did it in just one evening plus was running QRP and Chris VK2ACD definitely our best VK supporter over recent years.

Next deadline for copy is
10 November 2013

Activity Summary

Section	Stations Active			Logs Received		
	2013	2012	2011	2013	2012	2011
ZL CW only	8	15	9	11	7	6
ZL SSB only	42	58	57	14	17	12
ZL CW & SSB	17	15	11	3	8	8
ZL Total	71	88	77	28	32	26

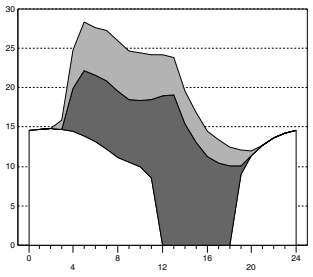
Memorial Contest 2013 - Results

Call-sign	QSO SSB	QSO CW	Pfx SSB	Pfx CW	Score
Mixed Phone & CW:					
ZL1PB	174	70	9	9	5652
ZL2AUA	148	76	8	7	4500
ZL2AYB	147	74	7	7	4130
ZL1DK	205	27	9	4	3367
ZL3VZ	125	73	7	6	3523
ZL2AL	92	47	8	7	2790
ZL1ALZ	66	44	8	6	2156
ZL2AQF	87	56	5	4	1791
ZL4IM	75	40	7	4	1705
ZL1ROK	40	51	6	4	1310
ZL3AB	18	32	5	4	738
Phone Only:					
ZL1JV	192		9		1728
ZL2CQ	187		9		1683
ZL2W	175		9		1575
ZL1YE	167		9		1503
ZL4RMF	161		9		1449
ZL1AA	144		9		1296
ZL1PO (QRP)	150		7		1050
ZL4DE	106		9		954
ZL2CAT	129		7		903
ZL1REG	118		7		826
ZL1LAP	38		5		190
ZL1FLY	44		4		176
ZM1G	36		6		144
ZL1WT (QRP)	37		3		111
CW Only:					
ZL2APV (QRP)		84		7	1176
ZL1BWG		74		6	888
ZL1WI		61		4	488
Australian Stations:					
VK2ACD	67		8		536
Check Logs:					
ZL1AIH					
ZL2DW					

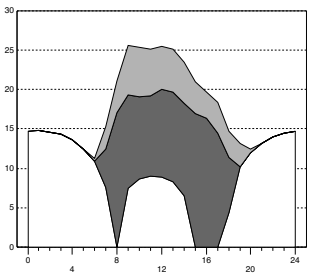
International HF Contest Calendar for October – December 2013		
Oceania DX SSB	Oct 5/6	<www.oceaniadxcontest.com>
Oceania DX CW	Oct 12/13	<www.oceaniadxcontest.com>
JARTS RTTY	Oct 19/20	<http://jarts.web.fc2.com/2013/rules2013.html>
WAG CW/SSB (Worked All Germany)	Oct 19/20	<www.darc.de/referate/dx/contest/wag/en/>
Ukrainian CW/SSB	Nov 2/3	<www.ucc.zp.ua/urdxc2013rules_eng.htm>
WAE RTTY (Worked All Europe)	Nov 9/10	<www.darc.de/referate/dx/contest/waedc/en/>
JIDX Phone	Nov 9/10	<http://.jidx.org/jidxrule-e.html>
Czech/Slovakia CW	Nov 9/10	<http://okomdx.crk.cz/index.php?page=english>
Bulgarian CW/SSB	Nov16/17	<http://okomdx.crk.cz/index.php?page=english>
CQ WW DX CW	Nov 23/24	<www.cq-amateur-radio.com/ cq_contests/index_cq_contests.html>
ARRL 10m CW/SSB	Dec 14/15	<http://www.arrl.org/10-meter/
Czech RTTY	Dec 21/22	<http://okrtty.crk.cz/index.php?page=english>
Croatian CW	Dec 21/22	<http://www.9acw.org/>
RAEM CW	Dec 29	<http://raem.srr.ru/>

Ionospheric Predictions

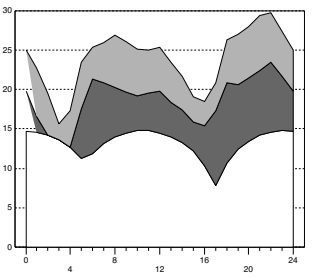
NOVEMBER / DECEMBER 2013 T-index = 70



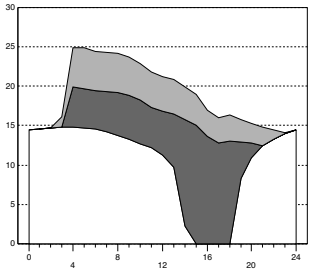
WN-
Moscow
(SP)
16548 km
312°



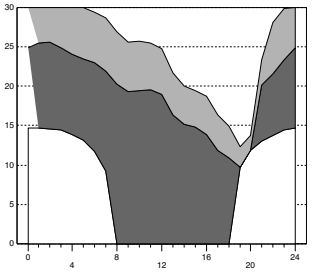
WN-
London
(SP)
18814 km
343°



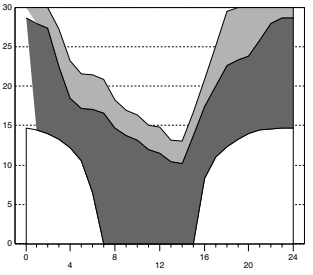
WN-
Jo'burg
(LP)
28265 km
31°



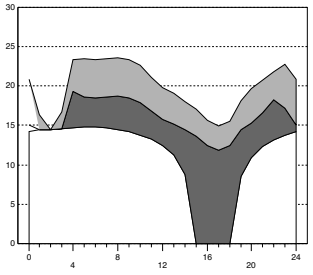
WN-
Istanbul
(SP)
17168 km
281°



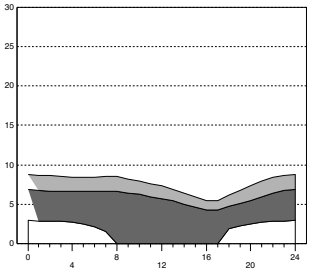
WN-
Tokyo
9274 km
332°



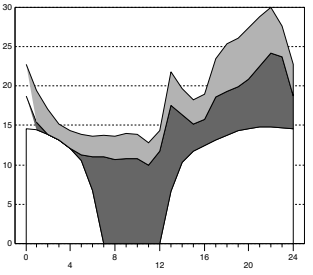
WN-
San
Francisco
10859 km
45°



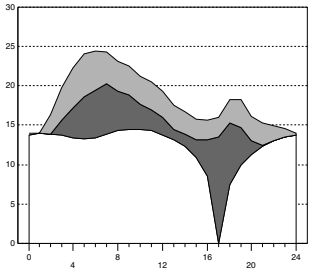
WN-
Cairo
16519 km
261°



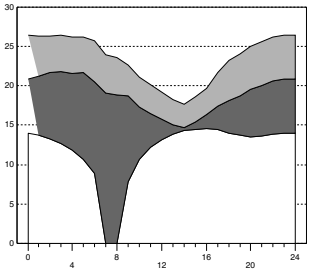
WN-
New
Zealand
300 km



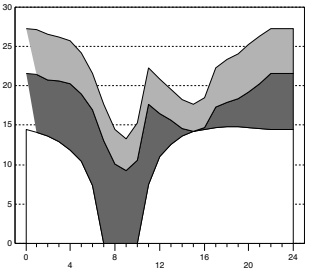
WN-
New
York
14402 km
66°



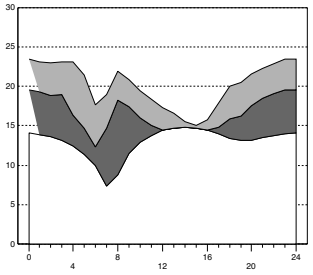
WN-
Jo'burg
(SP)
11759 km
211°



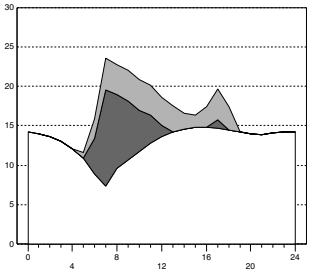
WN-
Rio de
Janeiro
11780 km
144°



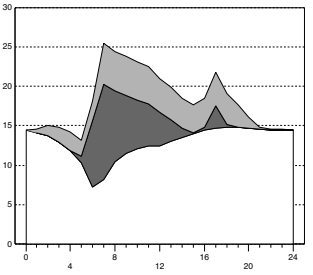
WN-
Barbados
13962 km
104°



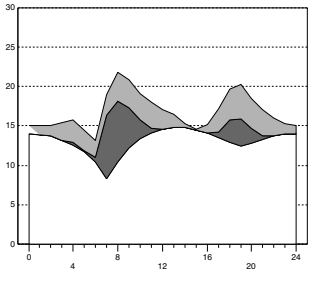
WN-
Dakar
16862 km
155°



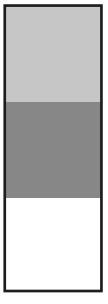
WN-
Moscow
(LP)
23476 km
132°



WN-
Istanbul
(LP)
22856 km
101°



WN-
London
(LP)
21210 km
163°



Horizontal axis shows time in UTC.

Vertical axis shows frequency.

Propagation is possible in the shaded areas, with best operation in the darker area.

These predictions are based on solar activity data supplied by IPS Radio and Space Services.

See pages 6–9, Break-In May/June 2004 "Choosing the Best Frequency" by the late John Gabites ZL2AQ for interpretation of forecasts and explanation of terms MUF, OWF and ALF.

HAMADS

WANTED RADIO VALVES: Cash paid for old radio valve collections ESPECIALLY BRITISH GEC TT21. Also wanted are vintage amplifiers, speakers and tape decks. Please Telephone Paul at (09) 528-2022 or E-mail <paul.ssegrub01@gmail.com>.

WANTED: CW Filter Crystal for Yaesu FT-890. ZL2AKW. Telephone (04) 479-5702 or E-mail <tc.koenig@xtra.co.nz> or *Call Book* Address.

WANTED: Valves wanted to purchase, fair price paid, all types but esp following types ECC32 ECC33 ECC34 ECC35 B65 6SN7 6SL7 ECC81 ECC82 ECC83 ECC803S ECC88 E88CC E188CC 7308 EF86 KT61 KT66 KT88 EL34 EL37 PX4 PX25 GZ32 GZ33 GZ34 GZ37 CV378 CV575 VT52 45 50 211 801 805 845. Also looking for an AVO or Weston Valve Tester and a good quality capacitor tester. Geoff Edwards, Valve Radio Spares, 12 Oxford St., Lyttelton 8082. Telephone (03) 328-9208 or (027) 433-8452 or Fax (03) 328-9207 or E-mail <tubehead@xtra.co.nz>

WANTED: World War One military radio or telephone equipment or parts therof. Contact Ross Jowitt ZL1UND. Telephone (09) 236-3761 evenings or (027) 492-0048 or E-mail <rossjowitt@xtra.co.nz>

WANTED: Kenwood TS830s Transceiver working or not working. Need for parts. ZL1WI. Telephone (09) 814-9550 or *Call Book* Address.

WANTED: As a Morse key collector I am trying to find a NZ bug key, made by A & W McCarthy, Dunedin. Can anyone help? Herman Willemsen VK21XV <hermanusw@gmail.com>

FOR SALE: IC-880H VHF/UHF D-Star – $500. Alinco DX-SR8 100 W HF Transceiver – $500. ZL2ADP. Telephone (06) 379-9097 or E-mail <mdvile@clear.net.nz>.

FOR SALE: B & K Analyst Model 1076-ES, PABX Philips SBX6, very high voltage supply Beam Rotator –Offers. ZL1TFX. E-mail <dale-marra@slingshot.co.nz> or *Call Book* Address.

FOR SALE: Yaesu FT-470. As new condition. Offers to ZL2AKW. Telephone (04) 479-5702 or E-mail <tc.koenig@xtra.co.nz> or *Call Book* Address.

FOR SALE: Beacon step-down Transformer 230/115 V, 1000 VA cat. V49 good condition, 26kg, prefer pick-up, $50 <zl2aft@clear.net.nz>. Telephone (06) 358 8403.

LOW POWER FM / LPFM tutorial and U.S. Ramsey brand 1, 50 watt pro-grade transmitters, antennas and accessories stocked in New Zealand. **<www.ramseypacific.tv>**; updated and expanding content. "We know low power FM broadcasting!" Ask at **<skyking@clear.net.nz>**; (09) 406-1282.

Break-In Advertising Manager Position Vacancy

Incumbent *Break-In* Advertising Manager wishes to retire. Interested persons please contact –

Lorne Douglas ZL2AHB at <advertmanager@nzart.org.nz>
Telephone (03) 358-9100 or 027-458-9101 or
John Walker ZL3IB *Break-In* Editor at <editor@nzart.org.nz>
Telephone (03) 348-9084 for further information.

Answers to crossword on p37

Across: 1 nickel metal. 7 pump. 9 pica. 10 AC. 11 hydride. 13 east. 15 top shelf.17 asp. 19 US. 20 Amy. 21 knots. 22 bosn. 24 ambient. 27 asks. 28 selectivity. 30 hop.

Down: 1 Napier. 2 CTCSS. 3 mach. 4 apprehend. 5 LU. 6 op. 8 modulate. 12 yips. 14 top. 16 outstrip. 17 AM. 18 symbols. 20 Adams. 22 bench. 23 on. 25 QSY 26 isle. 27 ATU. 29 to.

Hamads and Classified Advertising in *Break-In*

Hamads up to 30 words are now free as a service to members but the following conditions will apply:

(1) Hamads. A single, free Hamad in each issue of *Break-In* is only available to financial members and Branches of NZART buying or selling personal equipment. Members and Branches wishing to use this service must include their NZART Membership Number or other evidence of membership. If possible they should use the official HAMAD form (on the reverse of their address sheet). If this is not convenient the advert may be emailed or sent typed double-spaced, but proof of current membership must be provided.

Each free Hamad is limited to 30 words; any extra words will be charged at the current rate of 25c per word, telephone and fax numbers count as two words each, e-mail addresses and *Call Book* address as three words each. All prices include GST. Free Hamads will also be accepted for sales of deceased estates where the member was a financial member of NZART during the past 12 months and from branches who are financial members of NZART (ie have a Membership No).

Advertisements are accepted in good faith from amateurs and may only be used be the sale of used radio and allied equipment. The Association, or its representatives, can take no responsibility for them nor take part in any discussion resulting from sales or purchases; remember "Caveat emptor". In case of dispute, the Editor's decision is final.

Trade or business adverts, even from members, will not be accepted here, since this is a subsidised service to members.

(2) Classified Advertisements are available to members, non-members and commercial firms offering products or services for sale, etc. All adverts not meeting the Hamad criteria will be considered to be Classified Advertisements.

Classified Advertisements will be charged at 40c per word. Bold type is available at 50c per word. For semi-display (ie rule above and below) add $5.00. All Classified Advertisements must be pre-paid, receipts will not be given. All prices include GST.

(3) Display style adverts will be still be charged for at the current rates.

(4) Closing date. Please send Hamads and Classified Advertisements to The Advertising Manager, PO Box 1733, Christchurch, to be received no later than the 10th of the month prior to publication. Please make cheques payable to NZART; no cash or credit cards. The Editor and NZART Inc reserve the right to discontinue or decline any advertisement.

For further information and commercial advertising rates, please contact:
Lorne Douglas ZL2AHB, Advertising Manager, c/- PO Box 1733, Christchurch. Telephone (03) 358-9100. E-mail: <hamads@nzart.org.nz>.

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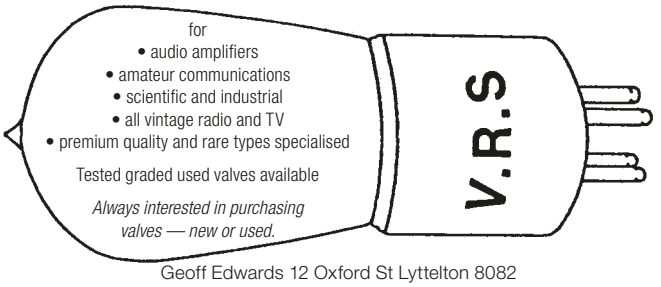
Importers and stockists of quality valves of all types and related items


for
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Sale of Used Radio & Electronic Equipment
St Stephens Methodist Church Hall
376 Yaldhurst Rd Christchurch —city side of Johns Rd & Yaldhurst Rd Cnr

Saturday 5th October 2013 — 9.30am to 3pm
Clearance Auction approx 2.00pm

Boot sales sites, trailers sites and tables available from 8.00am at $20 each, pre-book ph or txt Keith @ 021 658899 or email Keith@webstyle.co.nz

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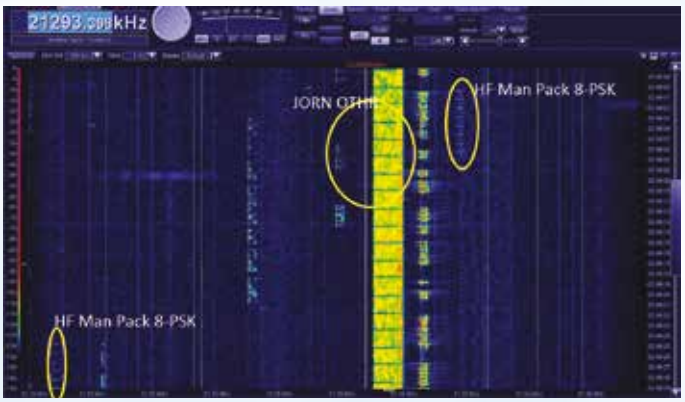
Paul Ormandy ZL4PW's antennas.

Trevor King ZL2AKW's well equipped shack.

Amsterdam Is FT5ZM.

Left to right: Margaret ZL1MB, Sharon ZL1TJU, Ngaire ZL1KN, Marlene ZL1MYL, Lynnette ZL1LL and Maxine ZL1FW.



Examples of Australian JORN, OTHR and HF Man Pack 8-PSK signals.

Harry ZL2ADU's EME antenna array.

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HF, 50MHz, 144MHz, 430/440MHz, 1200MHz* – full coverage!

* Optional UX-9100 required.

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